THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LXV.—No. 23
Whole No. 1,122.

NEW YORK, MONDAY, DECEMBER 7, 1896.

$3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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DEATH OF MR. JOSEPH R. THOMAS.

Mr. Joseph R. Thomas, the Editor of the JOURNAL, died at his home in Glen Ridge, New Jersey, on the evening of Saturday, November 28. The funeral services were held in Christ Episcopal Church, Glen Ridge, at 2:30 P.M., Thursday, the 3d inst. The JOURNAL for next week will contain an outline of his long, useful and honorable career.

[OFFICIAL NOTICE.]

Annual Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, Nov. 30, 1896.

The annual meeting of the Society of Gas Lighting will be held in The Arena, No. 39 West 31st street, New York City, at 3 P.M., Thursday, December 10.

F. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

December Meeting, Guild of Gas Managers.

OFFICE OF THE SECRETARY, Dec. 2, 1896.

The December meeting of the Guild of Gas Managers will be held in Young's Hotel, Boston, Mass., at noon of Saturday, the 12th inst.

A. K. QUINN, Secretary.

[OFFICIAL NOTICE.]

Place for Holding Next Annual Meeting, Ohio Gas Light Association.

THE OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY, COLUMBUS, O.,
November 20th, 1896.

To the Members of the Ohio Gas Light Association: At a meeting the Executive Committee, held on the 17th inst., it was unanimously voted to accept an invitation of the Managers of the "Gas Exposition" to hold our next annual meeting in New York city, Wednesday and Thursday, February 3d and 4th, 1897. Previous to taking this action, notices had been mailed to each member asking for an expression of opinion regarding the advisability of such a change. The replies were almost unanimously in favor of holding the meeting in New York.

The managers of the Exposition have very kindly offered every assistance in their power to make the meeting a success, and if each of our members will arrange his affairs so as to attend and take an active part, there is no question but that the "Thirteenth Annual" will be the most profitable and interesting meeting yet held. No such opportunity has ever before been offered for the examination of gas appliances as will be given us. Be sure to take advantage of it. Remember this is "Ohio year," and let there be a large attendance of Ohio men at this meeting. Special railroad and hotel rates have been promised, the nature of which will be announced in a later circular. Efforts will be made to have as many as can arrange to do so, go on the same train, for which special sleeping cars will be reserved. Yours respectfully,

A. P. LATHROP, Secretary.

BRIEFLY TOLD.

THE VALUE OF "SHORT TOPICS" AS PROMOTERS OF USEFUL DISCUSSIONS.—To-day we conclude our abstract report of the proceedings of the St. Louis meeting of the American Association, and we submit that the last chapters of the records of that assemblage will be read with pleasure and profit, for the short topics handed in by Messrs. T. Littlehales, A. C. Humphreys, A. B. Slater, Jr., and A. E. Forstall, were on themes of so practical a nature, and were so pithily put, that everyday application of their teachings may be made in every gas works in the country. The discussions that followed showed beyond doubt that the "short topic" is to remain a feature of the technical side of our Association meetings, and the whole scheme proves that the success of gas conventions from a technical point of view is not by any

means dependent upon the preparation of set papers of more or less length or abstruseness. The "topics" by Messrs. Littlehales and Humphreys had much in common, in that the first bore the title of "Service Pipes and Service Piping," while the second was on "Coating Service Pipes," and both had so much in support of commonsense practice, said in such a way, too, that when it was said it was comprehensible, that little is left to us for comment, other than to remark that if anything was omitted in the papers, the proper links were supplied in the discussions. Beyond a doubt it pays, and pays well, to test service pipes before putting them in the ground; and a like verdict goes in respect of coating them. The topic by Mr. Slater, on "The Use of the Jet Photometer," is in that gentleman's best vein, and it brings to mind the thought that its brevity by no means conceals the amount of research that its preparation involved. The discussion on the topic must be conceded to have been eminently fair, in that a summary of it puts the value of the jet photometer as an aid to the gas man just where it belongs—properly adjusted, carefully watched and intelligently handled, as a rough and ready estimator of candle power during the times of gas making, it has a permanent value in a gas works. Mr. Forstall's deductions anent the question of "Wet or Dry Heat—which Gives the Best Results in Purification?" have the stamp of actual trial; and as his trials are based on the desire only to get at the reality, even if the outcome be rather in contravention of a previously accepted theory, it is likely that the "dry heat" method will be threshed out at other places than Newark this winter, where some indecision has existed in respect of the certain plan to work to. When all the lines that were brought out through the "short topic" innovation have been well scanned, no other conclusion can be reached than that the innovation is to be a permanence on the programme of future meetings of our Associations.

MR. SOMERVILLE'S OPINION AS TO THE WISDOM OF INSPECTOR SWINDELL'S ADVICE.—Last week we published a letter from Mr. M. G. Wilder, of Philadelphia, in which that gentleman commented on the advice given through the public press of Baltimore by the official gas inspector of that city (Mr. W. H. Swindell) to the gas consumers as to how they might in their houses reduce a seemingly excessive gas pressure—Mr. Swindell's advice was reprinted in the JOURNAL for September 23d. Mr. Wilder's letter was preceded by some comments of our own, the force of which we believed was directed more against the unfortunate zeal of Mr. Swindell rather than to any other point in the controversy, and to regretting that public officials, occupying positions similar to that held by Mr. Swindell, often lost their positions, through reversals in elections, just at the time they were beginning to really comprehend the true nature of the duties they had been named to perform. Of course, every one knows that fair differences of opinion may exist about any matter, and in that view we append the following letter on that subject, just to hand from Mr. James Somerville, Engineer and Superintendent of the Indianapolis Gas Company:

To the Editor AMERICAN GAS LIGHT JOURNAL: It seems to me your remarks, and those of your correspondent, Moses G. Wilder, in the last issue of the JOURNAL, concerning the advice given through the public press of Baltimore by Mr. Swindell, to those consumers who complain of an excessive pressure of gas, are entirely too severe and uncalled for. I consider his advice most excellent and full of common sense, and, if acted upon, will certainly result, as he states, in reduced gas bills, and give them a better light. It is the same advice I have often given to my consumers, when I was distributing gas in cities where there was considerable difference in the altitude of the houses. How often have we heard the remark that the gas company increases the pressure for the purpose of forcing the gas through the meter, and we as often reply by pointing to the stopcock at the meter and saying that the pressure is entirely under your own control. The stopcock is placed there for the purpose of controlling the pressure, and it would be a good thing if all our consumers would so understand it. Surely Mr. Wilder is wrong when he says that the pressure is not uniform 25 minutes at a time. If he will look on the recording gauge on the governor outlet at the gas works, I am sure he will admit that the pressure is fairly uniform. But in many towns the houses built on the hills have, of necessity, an excess of pressure; and it is to the occupiers of those that the advice of Mr. Swindell is, I consider, sound and timely.

NOTES.—The management of the elevated railroad system of New York have decided to light the coaches by means of compressed gas. ——Mr. George Griffin has been appointed night superintendent for the Hartford City Gas Light Company.——Mr. George B. Ashcraft has accepted the Superintendency of the Citizens Gas and Electric Company, of Jacksonville, Fla.

[ABSTRACT OF PROCEEDINGS.—Concluded from page 853.]

TWENTY-FOURTH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

HELD IN THE PLANTERS' HOTEL, ST. LOUIS, MO., OCTOBER 27, 28 AND 29, 1896.

SECOND DAY, OCTOBER 28—AFTERNOON SESSION.

The President announced that two short topics received were on subjects so closely related that, if no objection were offered, the topics would be read so that a joint discussion might ensue. That course was agreed to, and Mr. T. Littlehales, of the Syracuse (N.Y.) Gas Company, read the following on

SERVICE PIPES AND SERVICE PIPING.

This being literally a "side issue" in gas distribution, the subject often fails to receive the full attention which it deserves.

In many places the gas company does not take the trouble to thoroughly test the service pipes before they are laid, and yet there is probably no phase of distribution work which will better repay the time, trouble and expense incurred to secure perfection than the right and careful testing of service pipes before they are laid. The following data on this subject are respectfully submitted:

Four or five years ago, being desirous of satisfying myself as to whether it did really pay to test the pipes as carefully and rigidly as I had been doing for many years, I made a special note of one consignment of 12,000 feet of ¾ and 1-inch tubing, which was of European manufacture. The pipes were tested under the ordinary steam boiler pressure of 30 to 40 pounds per square inch. Every defective spot was cut out, and the whole of the defective pieces screwed together; and a test was made as to what gas they would pass. The result showed, at 2 inches pressure, there was a leakage of 40 feet per hour, equal to 960 feet per day, or 350,400 feet per annum. The cost of testing and coating was about one-tenth cent per foot, or $12 on the whole lot; or, in other words, there was a saving of 350,000 feet of gas per annum for an outlay of $12. Surely this will pay in every place—except where they can make gas for less than 4 cents per 1,000 feet; and when I add that the leakage account for last year, in the works in which these rigid methods were carried out, was under 5 per cent. on the gas made, that is the best evidence as to whether or not that kind of inspection and care pays.

During the past summer at Syracuse a similar test has been made, and the following is an extract from my note-book of the result:

"In February, 1896, the Syracuse Gas Company received a consignment of service tubing, consisting of: 10,000 feet ¾-inch; 1,000 feet 1¼-inch; 12,000 feet 1-inch; 1,000 feet 1½-inch; 2,000 feet 2-inch: Total, 26,000 feet.

"Every length was tested by steam pressure from the boiler at the works, and 10 defective spots were found in the whole lot, which were cut out, screwed together and tested. It was found that at 1½-inch pressure the leakage was 35.3 feet per hour, equal to 299,228—say, in round figures, 300,000 feet per annum; and at 2 inch pressure the leakage was 46.15 feet per hour, equal to 404,274 feet per annum. The defective spots were either scale holes, or defective weldings, and were of such a character that it was a thousand to one against their being discovered in passing through the hands of the service men, in the ordinary way without testing, although, generally speaking, the consignment was an excellent quality of pipe."

While the pipes were heated by the steam they were painted over with a thick coating of composition of boiled tar and rubber, and when they are put in the trench they receive another coating of the same mixture, and laid on as thickly as possible; if as thick as porridge, so much the better, as a good coating will then lay on top of the pipe, where most of the corrosion in service pipes takes place.

Connecting Services to Mains.—Every member of the Association has probably seen many cases, especially in the smaller sized mains (3-inch and 4-inch), where the main has been broken in two, right through the hole made for the service pipe; a breakage of this sort means a loss in gas that would pay ten times over the cost of a suitable clip bolted on to the main, which would at the same time give a better thread hold for the service pipe, and strengthen the main at a weak spot.

For the past 20 years I have never had a service pipe connected to a 3-inch or 4-inch main without using a clip, and where a 1½ inch service goes into a 5-inch main a clip should be used.

Size of Service Pipes.—Probably most of the older gas men will remember that, in their earlier days, ½-inch services were not uncommon,

especially to street lamps, and while of course no one would think of using that size now-a-days, it is questionable if we have generally gone as far as is desirable in increasing the size of services.

A shrewd and able gas brother, from the Eastern States, rather startled me the other day when discussing the service pipe question by saying, "We never think of laying anything less than 1¼-inch service pipe to any building." At the time I thought that rather an extravagant notion; but the more the matter is carefully examined the more will be found to be said in favor of the idea. The first consideration that will naturally occur is the extra cost; well, what does it amount to?

Assuming a service of 100 feet in length, the value of pipe in Syracuse alone would be: For ¾-inch, say, about $2.05; 1-inch, $2.84; 1¼-inch, $3.93.

Now, inasmuch as in the settlement of a ¾-inch pipe from any cause to the small extent of ¾-inch, there is a depression in which condensation can collect sufficiently to entirely shut off the gas, and in a service located a mile or more distant from the gas works the cost in a single season for labor to clear a couple of stoppages would exceed the difference in cost for the larger sized service pipe, which would run so much longer without attention, and at the same time avoid the inconvenience to and complaints of consumers of insufficient supply, the question of larger services is one well worthy of consideration by the members of the Association, and any gas manager who lays down an absolute rule to have every foot of service pipe tested and coated before it is laid will never have cause to regret the time, trouble or expense incurred in so doing.

Service Cocks and Boxes in the Sidewalk—Are they of any Value Commensurate with their Cost?—In my judgment decidedly "No," except in special cases of large buildings or mills, factories, etc., because, if the stopcock boxes are to be of any value, they must be looked after, examined, kept clean and in proper working order—which, as a rule, they are not—so that they can be opened or closed at a moment's notice. If this is not done they can be of no possible use, for they would never be ready when required. To keep them in order would require an examination at least every three months, involving an expense altogether out of proportion to any advantage that can be gained, and even to find them under the snow is no easy matter. I have worked under both systems—with and without them—and my definite conclusion is that outside the building they are of no practical value, except in the special cases mentioned.

Steel versus Iron Tubing.—There is a wide divergence of opinion among gas men as to the superiority of either steel or iron tubing, but to my mind the most important of all considerations in this line is the question of durability. I have tried in a great many directions to obtain facts bearing on this point, and the only ones of any definiteness that I have been able to obtain are the two following, which I consider perfectly reliable:

From National Tube Works Company—Steel versus Iron—"Answering your favor of the 25th, steel corrodes a little faster at first than iron, but iron soon overtakes it and then keeps on corroding, while steel stops. The reason at the start steel oxidizes more rapidly than iron is the iron is covered more or less by scale which temporarily retards oxidization. The above is based on the experience of ship builders in the use of steel and iron, and of chemical experiments in the laboratory. Our own experience has proved conclusively that boiler tubes made of our Monongahela steel will withstand the action of bad water, such as we have at McKeesport, far better than any ordinary iron tube that can be supplied. We are not only putting steel tubes in our stationary boilers, but are also using them in our locomotives with the most satisfactory results."

From Riverside Iron Works: "Tests on corrosion of iron and steel, made at the laboratory of the Riverside Iron Works, March 16, 1891: A piece of iron plate, and a similar one of Riverside soft steel, both clean and bright, were placed in a sandy loam with which had been thoroughly incorporated some sodium carbonate, sodium nitrate, ammonium chloride and magnesium chloride. The earth thus prepared was kept moist. At the end of 33 days the pieces of metal were taken out, cleaned and weighed, with these results:

Iron, loss by corrosion.....0.84 per cent.
Steel, " " .....0.72 "

"The pieces were replaced and left 28 days longer, or 61 days from beginning of tests. with these results:

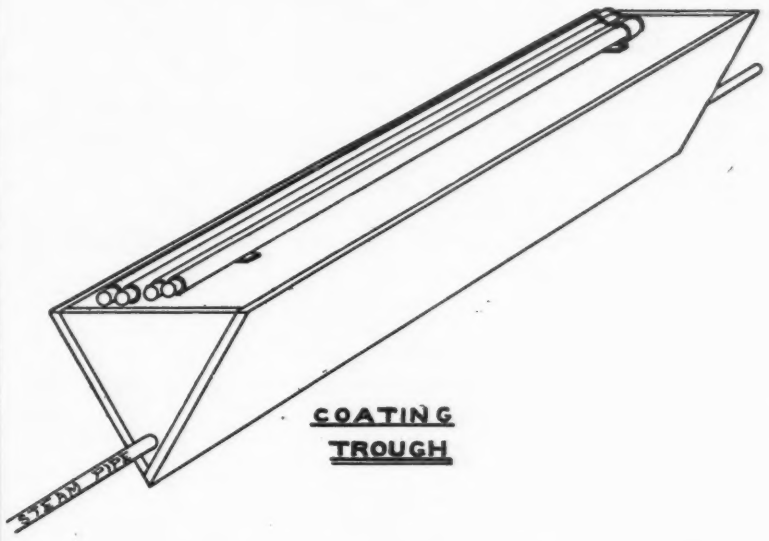
Iron, total loss by corrosion.....2.06 per cent.
Steel, " " " .....1.79 per cent."

I apologize to you for not complying as strictly as I should have done with the classification of a "short topic" under which this comes; but I had not the time to condense it.

Mr. A. C. Humphreys, of New York City, then read the following "Short Topic," entitled

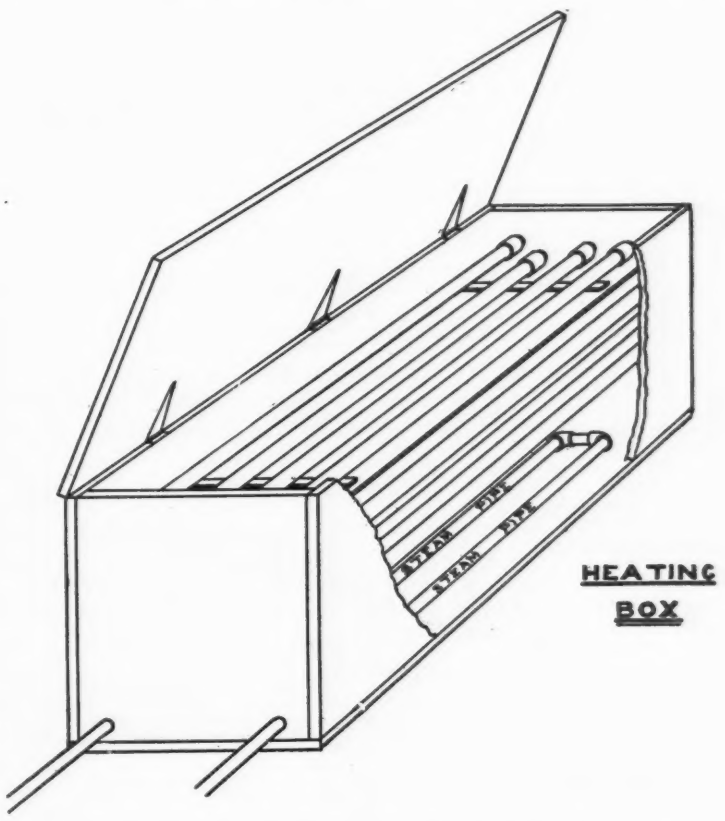
COATING SERVICE PIPES.

Our President has asked me to bring forward a "Short Topic" for discussion. Quite a number of subjects have suggested themselves, but I have finally decided that I could not do better than take up one element in that most important subject of leakage, or unaccounted-for gas. This general subject is by many looked upon as having been discussed and rediscussed until it is now thoroughly threadbare. Perhaps



that accounts in part for the subject being one that is, in my opinion, more generally neglected than any other connected with our business.

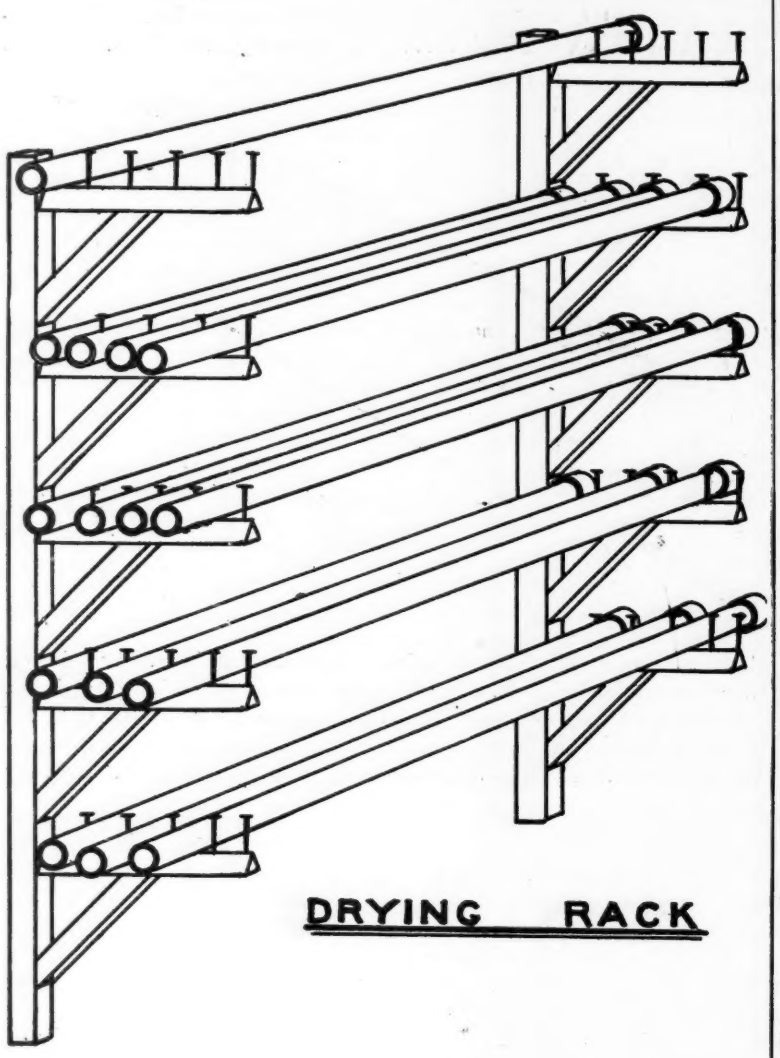
As an examiner of many works in connection with contemplated purchase, and as an operator of many works, I have perhaps had unusual opportunities to know what is going on in this direction in many



parts of our country. I have many times been astonished in the extreme at the condition of affairs which a thorough examination developed, and this even in the case of works which were in other directions well managed. I have often been able to show a material improvement in the net earnings, by systematic work looking to correction of existing troubles and prevention of those threatened. I shall now simply refer to one item in connection with the scheme of leakage prevention, namely, the protection of service pipe from oxidation.

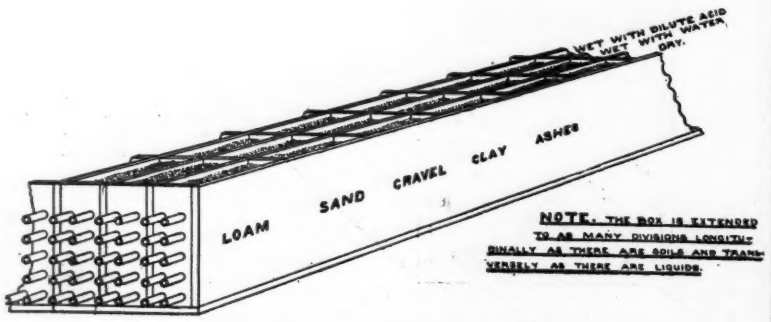
After deciding to take up this subject I found that my friend, Mr. Littlehales, contemplated bringing up the subject of service laying, but I find our two "topics" will work in well together.

Twenty-five years ago I commenced to give especial attention to this subject. During one of my first trips to Cincinnati I was discussing the question of service pipe protection with General Hickenlooper, who told me that he was coating all of his pipes with a certain mixture, which had been put to a continuous test of six years in competition with all the other methods then known to him. In this test a number of



DRYING RACK

complete sets of service pipes had been under comparison, each kind of coating being subjected to the action of a great variety of different soils and of moistening with a great variety of liquids. At the end of six years the one coating which had resisted all combinations of soil and moisture was the mixture he was then employing. This mixture they had then been using exclusively and continuously for 10 years,



METHOD OF TESTING DIFFERENT COATINGS UNDER VARIOUS CONDITIONS.

and they found the results in practice to fully confirm the results given by their most elaborate, thorough, painstaking tests. I obtained his permission to use the method in my works, and later obtained his permission to use it in all the works of the United Gas Improvement Company, and still later in other works which came under my supervision. I now have his permission to quote the details for the benefit of all interested.

So greatly have I appreciated the results thus obtained through the courtesy of General Hickenlooper, that I feel I am doing a service to the members of this Association in bringing it now prominently to their attention. The specifications given to me were as follows:

"Bring a kettle of tar (20 gallons) to a low boiling point, and add 20 pounds of fresh slaked lime, sifted over the top and worked down. Boil down to a paste, or a consistency about midway between tar and pitch. Let it settle for a few minutes, then add 4 pounds of tallow and 1 pound of powdered rosin, stir until they are thoroughly dissolved and incorporated with the tar, then let it cool and settle. Ladle off into barrels. When ready for use, to each barrel of 45 gallons of the above mixture add 4 pounds of crude rubber, dissolved in turpentine to the consistency of thick cream. Heat the mixture to about 100° F. and immerse the service pipe, heated to about the same temperature."

Part of the specifications may not be easy of performance, as, for instance, the dissolving of the rubber. The fact that there are difficulties to be met does not constitute a valid reason for neglecting to employ or for abandoning the use of this or any other good practice. This method has now been followed for many years in many of the United States gas works. It would be better if it had been used in many more.

No doubt there are other paints or mixtures which would give satisfactory results, if we could only be sure of the results in advance. The question is, has any other method so completely demonstrated its value? Failures have been reported from works under my charge; but in every case, I think, we have been able to show that the process was not to blame, but rather the lack of thoroughness or intelligence displayed in its application.

For instance, some had allowed the pipes to dry while in contact with each other, resulting in one pipe pulling the coating off the other. Some had operated under too high a temperature, resulting in the coating losing part of its elasticity. Some had failed to recoat in the ditch the places were the coating had been marred by the tools and otherwise in the laying. Others had omitted some of the ingredients of the mixture because in their opinion they were unnecessary. Evidently it is unfair to condemn a process where the specifications are thus willfully or carelessly neglected.

Mr. Littlehales is using this process, and he has figured that the cost per lineal foot for coating and testing the pipes by steam, which is done at the same time, is only one-tenth cent. per foot.

In addition, in the laying he covers the whole length of pipe over with a thickened mixture of the same kind, thus affording a shed for the protection of the pipe from drainage water. This adds to the cost, but no doubt the additional cost will be paid for in the long run.

I do not question that the more expensive methods employed in many cases in Europe are in the interest of the stockholders. If a method as good can be obtained at lower cost, so much the better. Such a method, I believe, I now bring to your attention.

Generally, too much care cannot be taken to insure the integrity of our underground distribution systems, for in the ground they are generally out of mind, and if not out of mind they are to a great extent out of our control.

Discussion.

The President, in inviting discussion on the topics submitted by Messrs. Littlehales and Humphreys, declared that the subjects were of great importance.

Mr. Harbison thought the short topics just listened to were of as great practical importance and value as any that had been read before any of the Associations for years. The topics treated of matters that came to them in their daily experience. He was pleased to know that Mr. Littlehales had been thoroughly converted to the idea that it was good policy to put in service pipes of large diameter. He had not used any coated service pipes in Hartford, but for something like 15 years they had not used any black pipe, galvanized pipe being employed exclusively. It was a fact that they were putting in no service pipes of a diameter less than 1¼ inches. Papers like those read could not fail to benefit them all. He had been aware of the plan followed by General Hickenlooper, but had failed to try it. Mr. Humphreys' presentation of the case made it so clear that he certainly would try it in Hartford. They were renewing services in Hartford now (the main system, too, was being completely overhauled there), some of which had been in the ground for 40 years. In many cases the iron of the pipes was completely eaten away and the service was virtually a core in the earth.

Mr. Thompson asked Mr. Humphreys for some explanation of the system or method by which the coating was applied to the pipe. Is the pipe so placed in the bath that the ends are covered, or can the coating enter the interior of the pipe? Also, are the pipes heated and freed from scale before applying coating? He would also like to know if

anyone had any further experience respecting destruction of service pipes by electrolysis?

Mr. A. C. Humphreys said he would have gone into greater details had he not thought that the "short topic" was already lengthily considered. The Cincinnati method was to have a trough long enough for dipping the pipe. They plugged or capped it, and had a handy device for putting it in and taking it out, the threads being perfectly protected. The mixture never got in the interior of the pipe. Another plan was to pass steam through the pipe for heating it to the proper degree, and then the coating was put on with brushes. His preference was for the Cincinnati method. A steel brush should be used for cleaning the pipes from scale, etc.

Mr. Littlehales preferred the brush system of applying, and supported his preference by instancing a case where complete success attended the coating of metal used in certain construction on the Grand Trunk Railroad.

Mr. W. S. Miller said the practice of dipping pipes in tar had been successfully carried on for 10 years. The pipes at times are tested in a specially prepared furnace, consisting of a boiler tube 25 feet long, which tube is heated up by using the waste heat from the furnaces. The pipes are put in this tube, and when at the right temperature (100° approximately) are taken out and dipped in heated tar.

Mr. Littlehales pointed out that the Cincinnati practice provided no means for proving the flawlessness of the pipe. He wished to make a strong point of such practice by showing that through an expenditure of $12, leakage to the amount of 300,000 cubic feet per annum was prevented. It is not enough to coat the pipe; for the prevention of leakage is fully as important as the preservation of the pipe.

Mr. Egner stated that the practice at Norfolk, Va., was to cap one end of the pipe, attach a steam hose at the open end and admit steam for a short time, which would develop any flaws that existed, and also heat the pipe. The hose was detached and the end plugged. The pipe was then raised by pick-up tongs, put in a trough, and afterwards drained.

Mr. A. C. Humphreys asked Mr. Harbison whether the galvanized pipe had been in use long enough to enable him to speak positively as to how it compared with black pipe?

Mr. Harbison replied that the soil in which it was buried had much to do with its length of life; but he thought it could be counted on to be serviceable at the end of 12 years, even in average soil or earth. Of course, no one could count much upon pipe that was buried in made ground, consisting of ashes, street sweepings, and so on. He was well satisfied with the length of time that the galvanized pipe lasted him on the average.

The President, in closing the discussion, said he knew he voiced the sentiment of the Association in declaring they were indebted to Messrs. Littlehales and Humphreys for the short topics submitted. He then introduced Mr. A. B. Slater, Jr., of Providence, R. I., who read the following on

THE USE OF THE JET PHOTOMETER.

In opening discussion on the use of the jet photometer it is not intended to condemn these instruments, but to call attention to a few points about them, the knowledge of which should tend to prevent the misuse to which they are too often subjected. We will first note a few of the different forms in which they have been applied.

As early as 1836 Alcock used a jet, regulating the pressure at the tip to a certain amount, and then judging the relative candle power of the gas by the height of the flame. Fyfe, in 1849, kept the flame at a constant height, and judged the power by the time which a cubic foot of gas would maintain it, this being called the durability test. In 1860 George Lowe brought out his apparatus, which was later improved by Sugg, Kirkham and others. In this form the flame is regulated to a certain height, and the pressure at the tip is taken as the index of the candle power. In 1867 Friedleben brought out his gasograph, which was practically a Lowe jet, used in connection with a meter which passed some of the same gas through a fine orifice against a fixed pressure, the speed of the meter giving a cue to the variations in specific gravity. Esson, in 1869, supplied the jet through a small meter with time recording attachment, similar to what is used on station meters. Thorpe and Tasker regulated a flame to specific height, mounting the jet immediately on top of an aërorheometer, the indicating disc of which pointed out the quality of the gas on the scale. In 1875 Victor Bablon mounted the jet on a meter or small holder controlled by clockwork, so as to keep the flow volumetrically uniform regardless of the specific gravity of the gas, and then determined the quality of gas by the height of the flame. Immediately after this Sugg brought out his illuminating power meter, which combined the idea of Bablon and Fyfe, and regulated the flame (using an Argand burner for the tip) to a fixed height, and judged the candle power by the amount of gas required to maintain it for one minute, the gas being supplied to the meter under a constant pressure. Webster's apparatus (1878) was practically the same idea, using a small holder of compensated immersion instead of the governor and meter. The form with which most of you are familiar, known as the Jones jet, is simply a jet mounted on a Giroud rheometer, which regulates the pressure at the tip, and the candle power is judged by the height of the flame, this being practically the original jet of Alcock, with a governor substituted for the pressure gauge.

Thus there have been practically three types used—viz.: Constant pressure, reading by height of flame; constant height of flame, reading by pressure; and constant height of flame reading by volume It will be noticed that all of these were originally designed to be applied to coal gas, and that the usual limits of candle power were about from 14 to 19. Sugg was almost the only writer who claimed that any of them were strictly accurate, but considering the extremely narrow range of variation in commercial coal gas as made from coking coals, he could substantiate his claim sufficiently to meet the requirements of commercial purposes. But it was found that, with cannel or oil gas of higher candle power, it was first necessary to reduce the flame, but that then the simple corrections for reduced pressure or volume would not suffice, and the specific gravity had to be taken into account. Some tried to cover this point by altering the size of hole in the jet, but without perfectly satisfactory results. Friedleben's experiments afforded much valuable data, and his results were summarized in a general way as follows:

A.—If the flame is lower with an equal or slower flow the gas contains CO_2 or other heavy gas, and has less lighting power.

B.—If the flame is lower with a quicker flow the gas contains CH_4 or NH_3, and has also less lighting power.

C.—If the flame is higher with a slower flow the gas contains olefiant gas and has also more lighting power.[1]

Various ideas were brought out. The builders of Lowe jets gave tables showing that the specific gravity was in a certain relation to the candle power, and accordingly some gas men undertook to dispense with photometers and to determine the candle power by the use of a specific gravity test. Some of these tables may be found in the little year books gotten out even at recent dates by some of the meter makers. It was also advanced that Sugg's illuminating power meter could be used with fairly accurate results to determine the percentage of CO_2 in the gas. These, with the experiments of Friedleben and others, all go to show that the *composition* of the gas must be taken into account in using the jet, that is to say, the jet photometer, in any of its present forms, must be specially adapted to the composition and specific gravity of the gas on which it is to be used, and accurate results must not be expected if it is used otherwise. For instance, a Lowe jet designed for coal gas will, if used without alteration, not give correct results on carbureted water gas, and if the jet is adapted for use with coal gas enriched with cannel it will hardly be quite correct if change be made to oil as an enricher.

The Jones jet is made in different proportions for coal gas and water gas; and, to illustrate the fact that a jet photometer will give reliable results only when used on the gas for which it is designed, let each one for himself take, for instance, a Lowe jet made for coal gas and try it on carbureted water gas, comparing it with the bar photometer; or, take a Jones jet for carbureted water gas and he will find that he can increase the specific gravity and candle power at the same time in such proportion that the height of the flame will remain the same; or, enrich hydrogen to a certain degree with acetylene and, with the same pressure and height of flame, note the difference in intensity of the illuminating power, which the jet will say is the same. Thus we find that the jet photometer must not only be so arranged as to regard the height of the flame, pressure at tip, and volume of gas in a given time, but the composition of the gas must also be considered as to its effect on the intensity of the light as well as the volume of the flame observed.

Discussion.

Mr. A. S. Miller asked Mr. Slater whether he understood him to say that the Jones jet worked at constant pressure, for his opinion respecting the Jones governor was supposed to be arranged for steady volume. It is not based on constant volume, however, since the constant opening and pressure tend to force gas through the opening; so as the volume varies with the specific gravity, it is neither at constant pressure nor constant volume. Although, he (Mr. Miller) had used the

1. *Journal fur Gasbeleuchtung*, 207. 1867.

Lowe jet for years, he was inclined to believe that it was valueless so far as an absolute determination was concerned. For instance, the reading would vary accordingly as the weather conditions changed, from hot to cold, or *vice versa*.

Mr. Norris thought that a more unsatisfactory instrument to the interests of the gas consumer had never been devised than the jet photometer.

Mr. A. S. Miller said, referring to the statement of Mr. Norris, that those who started out to make a case could almost make the jet photometer seem to prove anything. Five candle gas could be made to show on the jet photometer a lighting value of 10, 15, or 25 candles, simply from the size of hole. He thought, however, that fairly adjusted and handled with intelligence and care, the jet photometer was a valuable bit of apparatus to have in a gas works.

Mr. Somerville agreed with Mr. Miller, for he was sure that the jet photometer, when used with reason, was a good approximate estimator of lighting value.

Mr. A. C. Humphreys admitted the importance of the subject. He agreed with Mr. Norris that the jet photometer was a dangerous instrument and he agreed with Mr. Miller that it was of value, either verdict resting upon the way in which it was used. Properly adjusted and intelligently handled it could be made to yield fairly accurate results in quick working. Certainly one could not expend all one's time in working the bar photometer.

Mr. Somerville, in answer to a question from the President, said that he used a Sugg's jet, which was examined several times each hour. The instrument, of course, to be of real value, had to be used intelligently.

Mr. Littlehales said his experience with the Sugg's jet photometer was that unless it was frequently readjusted to the water level it could not be relied upon. In a warm room evaporation from the tank below is very rapid. You must, in fact, give constant attention to the matter of maintaining the water level.

Mr. Slater then closed the discussion as follows—we are indebted to him for a revised statement of his remarks: I think Mr. Miller called attention to the fact that the Giroud rheometer, which is the controller used with Jones jet, is a volumetric rather than a pressure governor. It is true that if the composition of the gas does not vary the rheometer will deliver the gas at a practically constant rate of volume, and as the size of opening in the tip is fixed, the effective pressure at the tip will consequently remain practically constant while the initial pressure may vary; thus it regulates the pressure because it does the volume. If the specific gravity of the gas varies, the flow will be about inversely as the square root of the specific gravity; for instance, in changing from coal gas to carbureted water gas, the change in gravity would be about from 440 to 620, or in volume of flow about from 25 to 21, or a loss of flow of about 16 per cent. The principal object of this paper was simply to call attention to the fact that the jet photometer should be used under the conditions for which it is designed. I have found in a number of small gas works that the jet photometer originally designed for coal gas was put right on to water gas and the readings given as correct. I know of one case where those readings were given in testimony in court as indicating the correct candle power of the gas.

The President said that another short topic had been submitted by Mr. A. E. Forstall, of Newark, N. J., on the subject of

WET OR DRY HEAT—WHICH GIVES BEST RESULTS IN PURIFICATION?

In the absence of Mr. Forstall, the Secretary read as follows:

A paper, read by Mr. F. G. Dexter, before the Gas Institute at its meeting in 1892, first attracted my attention to the advantage of heating gas just previous to its entering the purifiers. This paper advocated the injection of exhaust steam into the gas at the above point, and claimed that this addition of moisture secured longer service from the oxide of iron, due to the facilitation of the reactions of purification and revivification by its presence, and the prevention of the back pressure that would be caused by the drying out and caking of the oxide, if moisture was not added. The moisture was given the chief credit of the improvement in working that followed the use of steam, little stress being laid upon the effect of the rise in temperature that would naturally be caused by such use.

When, early in the winter of 1893-4, changes of purifiers began to come very frequently at the Newark works, in spite of the 1½ per cent. of air drawn in at the exhauster to effect continuous partial revivification, the suggestion contained in Mr. Dexter's paper was acted upon, and steam enough was admitted into the main outlet of the set of boxes to raise the temperature of the gas at this point up to 100° F. The result was an almost immediate increase of 200 per cent. in the quantity of gas passed per change of box, and this increase was maintained during the whole winter. But the great increase in the amount of moisture rendered extra siphons necessary for the removal of the water condensed in the pipes and boxes, while the oxide came out very moist, and one or two of the oldest lots were made so soggy that their revivification was a matter of great difficulty.

Owing to the distance between our purification house and boilers it is our custom to shut off the steam from the former as soon as the weather grows warm. When this was done as usual, early in April, 1894, the first box put on afterwards ran for four months, passing nearly three times as much gas as the best box during the time the steam was on, the oxide being the same. The slower rate of travel of the gas through the material, due to the smaller make of summer, accounted for some of this increased efficiency, but hardly for all; and this increase, taken in connection with the excess of moisture found in the oxide when steam was used, suggested that possibly the heat had been doing the extra work of the winter, as compared with the previous one, in spite of the moisture, instead of with its aid. However, this idea did not take any definite shape, and the same method was employed in the winter of 1894-5, with practically identical results. Again, after the steam was shut off, when the outside temperature was high enough not to carry away the heat generated by the reactions taking place in the boxes, the same efficiency was shown as in the previous summer, and the impression was confirmed that heat without moisture would prove a more effective agent in winter work.

The theoretical argument in favor of steam is as follows: Perfectly dry outside will not combine with sulphureted hydrogen. As the processes of purification and continuous revivification evolve heat, the vapor tension of the gas increases in its passage through the oxide, from which it, therefore, abstracts moisture, and if this constant loss is not made good by the addition of steam the oxide becomes too dry to work, even if it does not cake and cause back pressure.

Whatever may be the case in England, in this country there is no danger of back pressure from caking of the oxide. Boxes in which the oxide has caked so hard that it is almost impenetrable to a pick (and these are the rule with us when the oxide is fresh) show no signs of increased pressure, while wet, uncaked oxide invariably causes pressure; so, moisture is certainly detrimental in this direction. And while perfectly dry oxide will not combine with sulphureted hydrogen, the presence of a very small amount of moisture makes the oxide effective. In a monograph upon "Oxide of Iron," published serially, Vol. LXI., *Journal of Gas Lighting*, Mr. John T. Sheard says (page 634):

"Just as combustion cannot take place between perfectly dry gases, so it may be that the pressure of hygroscopic water, if only in infinitesimal quantity, is required to promote the natural reactions of sulphureted hydrogen and oxide of iron; and, judging from observations in certain experiments I have made, I am led to think that such is the case. Generally speaking, however, it may be said that the less moisture an oxide contains the more efficient it will be. * * Under ordinary circumstances it is not possible. * * * to obtain and apply the oxide absolutely deprived of moisture."

Considering now that the gas, leaving the scrubbers as it does saturated with water vapor, continually brings with it a fresh supply of moisture, to which is added the water (one volume of vapor for each volume of sulphureted hydrogen absorbed) set free in the reactions of purification, and only partially re-absorbed by the partial continuous revivification, it would seem that these two sources would supply sufficient moisture to promote the reactions between oxide and sulphureted hydrogen. Any further moisture is detrimental, and not of benefit.

Acting on this reasoning, we fitted up one of our boxes with a coil of about 140 feet of 1-inch pipe, laid on bricks below the first tier trays, and when this box was first in the series the gas was heated by passing steam through this coil, and no steam mixed with the gas. No change in duty was observed, but neither was there any back pressure, and the oxide came out of the box in every case dry and in good condition for quick revivification, while in the other boxes, where the gas was heated by admixture of steam, two lots of comparatively new oxide were made so wet as to render them unfit for use for several months. As a result of this test all of our boxes will this winter be equipped with 200 feet coils, and our verdict is in favor of "dry heat" for purification.

Discussion.

The discussion that ensued was participated in by Messrs. Nettleton Cathels, A. S. Miller and Hayward, and at the close the President assured Mr. Slater that his "short topic" had been greatly appreciated by the Association, as had also the one from Mr. Forstall, just read by the Secretary.

The President announced that the next business would be the discussion of the contents of the

QUESTION BOX.

The Secretary read as follows:

Question No. 1. "Where stopcocks and boxes are placed on services, what percentage of same have been used on account of fire or other causes?"

Mr. Harbison said that when he took charge of the Hartford (Conn.) works he found stopcocks on all the services. When he had occasion in every case to use them the general experience was that they might as well not have been there. For the last 25 years the only stopcocks placed on services were those supplying very large buildings, and then they were not placed at the curbstone but in vaults with iron covers. Thus the shutoffs were always accessible.

Mr. McElroy said it was their practice in Pittsburgh, and the practice of the natural gas suppliers also, to have stopcocks between the street mains and the services to the buildings. When a fire alarm was sounded a man carrying a wrench was at once despatched to the scene of danger. If he reported that he was unable to shut off the gas supply, the man whose duty it is to see that the shutoffs were in serviceable condition in that district is at once discharged. They used brass cocks set in sound boxes that cannot be opened by those mischievously inclined. The cost of maintaining them was inconsiderable. The shutoffs are inspected for condition by the men who take the meters. They did not wait for orders from the firemen to shut off the gas supply.

Mr. Cowdery said the practice at Milwaukee was to use stopcocks in sound boxes on every service. The firemen had keys to the boxes. When they removed a meter they always shut off the gas at the sidewalk stopcocks.

Question No. 2.—"Where services are laid free of cost, and there is no city or other restriction governing the question, is the use of stopcocks and boxes desirable or justified?"

The President said that as Question No. 2 was of similar nature to the previous one, they would consider that the discussion covered both.

Question No. 3.—"At what difference in speed would be the leakage from a faulty joint or other defective spot in main or service pipe when open and exposed, as compared with the leakage from the same defectives, when buried in the ground?"

At the suggestion of the President, the Secretary read the following letter, from Mr. Walton Forstall, of Lockport, N. Y., which related to the 3d Question:

"From some leakage work the writer has been doing this year, it would seem that, except in very close soil, the leakage is nearly the same whether the main is exposed or buried. By valving certain sections and shutting off all meters involved, leakage was ascertained as a certain number of feet per hour. Afterwards, as each leak was discovered, it was estimated as seen burning, and when the total of all leaks was made up equaled about that shown by the first test, a second was made, though all of the section might not yet have been investigated. The usual result was that the second test showed less than the first, by about the leaks thought to have been found."

Mr. Littlehales said he had asked from several parties opinions bearing on this question, and he had received such a diversity of replies that he instituted some experiments on his own account. His plan was to arrange a special clamp to cover the pipe joint. A small test meter connected with the pipe showed the speed of the gas flow. From the outlet of the meter he put a pipe below the main, replaced the earth, packing it as much as possible. turned on the gas and observed the difference. Mr. Littlehales then read the following memorandum from a diary: In the test for leaks in street mains, it was desired to find the comparative rate at which the gas would percolate through the ground, as against the free escape from the leak in pipe when the ground was open. On June 30, 1896, the following test was made: A leaky cement joint having been discovered a special clamp was put on it, and the escaping gas therefrom was collected and passed through a test meter, and found to be 1 foot in 9½ minutes, which is equivalent to 55,480 feet per annum. Then, from the outlet of the meter, a pipe was taken down to bottom of trench underneath the main, and the ground thoroughly rammed in to fill the hole. The gas was then turned on, and 1 foot was passed in 9¾ minutes, which is equal to 53,874 feet per annum. This was repeated several times under these conditions. The soil in this case was sandy loam. On July 9, 1896, a second test was made of this same effect, and the result was as follows: Four feet in 22½ minutes, escaping direct from meter; 4 feet in 22¾ minutes, returned to ditch and earth rammed in again.

The President declared that tests of the nature given were very valuable to the members.

Mr. Prichard said he would look for varying results in this instance from the nature of the soil in which the pipes were laid. Last summer he bared a service that was virtually but a streak of rust, still the leakage from it was inconsiderable—the service had been buried in a deposit of clay.

Question No. 4.—"To what extent is the leakage account affected, by putting in the ground service pipe that has not been tested before being laid?"

Mr. Littlehales said that with him 12,000 feet of tested pipe showed a leakage equivalent to 300,000 cubic feet per year, and he thought it would be safe for anyone to calculate on the same basis. He had tested two lots of pipe—one English and one American; and the latter was shown to be the more satisfactory. The pipe tested was service pipe of the ordinary or standard weight.

Mr. McElroy thought it paid to use extra heavy pipe even if it did cost more.

Question No. 5.—"The writer has several times heard it charged that gas companies do not encourage the introduction of Welsbach lamps among their consumers because they consume less gas than the open flame burners displaced. It was definitely so charged at the meeting of 'Lighting Committees and Inspection' at New Haven last June. As the writer looks at the matter the Welsbach lamp is the gas company's friend, whether it stands on the combined fixtures beside, or in place of, the discredited incandescent electric bulb, or sheds its radiance from the gasalier where before was a 5 foot open flame tip, and his apology for this contribution to the Question Box is his desire to know if, and, if so, why, he is wrong. It is a well recognized law that the economical use is the father of large sales. Is the gas business an exception to this law?"

Mr. Shelton said he admitted the use of the Welsbach burner cut down the quantity of gas used per burner, but that in Chicago this cutting down had been far more than made up by the number of incandescent and arc electric and oil lamps which the Welsbachs had replaced. There is no doubt that the result has been a marked increase in the net gas output. The Welsbach burner, if properly handled and looked after, is a friend, and a good friend, of gas companies wherever situated.

Mr. A. C. Humphreys agreed in the main with what Mr. Shelton had said, but he thought that the practice followed in some places by the Welsbach Light Company of putting the local agency in the hands of others than the gas company was not altogether sound. Such agents often considered that their duty in connection with the burners was at an end when they had sold them. He thought that the gas companies were the real friends of the Welsbach light, and, that being the case, the gas companies were the best agents to put in charge of the placing of the burners.

Mr. Nettleton firmly agreed with that part of the question which read, "as the writer looks at the matter, the Welsbach lamp is the gas company's friend." In his experience, at least, that was beyond doubt. Mr. Nettleton then recounted the set charge made against the Derby (Conn.) Company, 1894, by the manufacturers and sellers of a patented apparatus for supplying oil lamps automatically with oil through gas fixtures. At the New England Association meeting of that year, in conversation with a brother superintendent who had had a similar experience, he thought he had obtained a knowledge of a weapon to put the kerosene oil apparatus men to rout. He eventually visited the Welsbach factories at Gloucester City, N.J., and what he saw there induced him to purchase a number of the lamps. He brought them to the notice of the residents of his district, and the result was he routed his competitors; not only so, but he actually secured as new consumers some who had theretofore used oil only.

Mr. Butterworth said that in Columbus, Ohio, the Welsbach burner had been, and was, an unequivocal success. They had there replaced great numbers of electric lights with Welsbach lamps. They maintained the lights at a stated per annum rate, which worked very well with them.

Mr. Raynor said that at Adrian, Mich., the Welsbach lamps were great aids. They had enabled them to successfully compete with electric lights and kerosene oil. In fact, the lamp was the best friend they had.

Mr. A. C. Humphreys hoped his position would not be misunderstood, for he was a believer in and advocate of the Welsbach lamp. His point was that an ordinary agent not connected with the gas com

pany, was not as likely to take the same pains in looking after the lights when once put up, as the gas company would. The gas company had an interest in the future of the lamp which the ordinary commercial agent had not.

Mr. Shelton said that the business of the Welsbach Company had increased enormously of late, and that though it was quite a difficult matter to see to it that its 1,400 or more agencies throughout the country were in the best hands, in each particular locality, it nevertheless was a fact that the Company was surely getting down to the plane where such a desirable result would be secured. He knew very well, too, that the initial sale of a Welsbach, and the placing thereof, were not the only things essential to the continued success of the lamp. The lamps must be carefully looked after, and if the ordinary agents did not follow this course, the home Company could be trusted to see to it that all complaint on that score would be done away with. In Chicago the burners were a success in every respect.

Mr. Coggshall said that much credit was due by gas companies to the Welsbach light. They thought that it would be better at Fitchburg, Mass., to have the agency for the sale of the lamp in the hands of a private party than that it should be controlled by the Gas Company; but both worked in harmony. They had, perhaps, 3,000 Welsbachs in use in Fitchburg, many of which had displaced electric lights—the Gas Company was in the electric business, too—but the output of both their departments was increasing.

The President announced that the regular business of the Association was at an end. Then followed formal votes of thanks to the retiring officers, to the Laclede Gas Company and to the local committees on Reception and Arrangements, after which the President declared the meeting adjourned.

ROLL CALL.

The following members were in attendance at the meeting:

Honorary Members.

F. E. Barker, Boston, Mass.

Active Members.

Battin, I., Omaha, Neb.
Baxter, I. C., Detroit, Mich.
Blodget, C. W., Brooklyn, N. Y.
Boardman, A. J., Tampa, Fla.
Branch, A. H., Denver, Col.
Bredel, F., Milwaukee, Wis.
Brown, E. C., New York City.
Buckman, J., Philadelphia, Pa.
Burke, J. E., Princeton, N. J.
Butterworth, I., Columbus, O.
Callender, E. P., Little Falls, N.Y.
Carroll, F., New Orleans, La.
Cathels, E., Hamilton, Ont.
Chollar, B. E., St. Louis, Mo.
Clark, W., Philadelphia, Pa.
Coggshall, H. F., Fitchburg, Mass.
Cowdery, E. G., Milwaukee, Wis.
Cressler, A. D., Fort Wayne, Ind.
Croul, J., Detroit, Mich.
Daly, D. R., Jersey City, N. J.
Dell, J., St. Louis, Mo.
Dickey, C. H., Baltimore, Md.
Doherty, H. L., Madison, Wis.
Doty, P., Long Branch, N. J.
Douglas, H.W., Ann Arbor, Mich.
Dunbar, J.W., New Albany, Ind.
Egner, F., Norfolk, Va.
Eilbeck, A. B., Philadelphia, Pa.
Forbes, J., Chattanooga, Tenn.
Frost, W. H., Fort Scott, Kas.
Gardner, W., Pittsburgh, Pa.
Green, J., St. Louis, Mo.
Greenough, M. S., Cleveland, O.
Gribbel, J., Philadelphia, Pa.
Guldlin, O. N., Fort Wayne, Ind.
Harbison, J. P., Hartford, Conn.
Harper, G. H., Altoona, Pa.
Helme, W. E., Philadelphia, Pa.
Humphreys, A. C., N. Y. City.
Humphreys, C. J. R., Lawrence, Mass.
Kellogg, L. L., Sioux City, Iowa.
Lansden, T. G., St. Louis, Mo.
Leach, H. B., Taunton, Mass.
Littlehales, T., Syracuse, N. Y.
Lynch, E. T., Detroit, Mich.
Mayer, F. T., Baltimore, Md.
McCullough, E. H., Phila., Pa.
McDonald, W., Albany, N. Y.
McElroy, J. H., Pittsburgh, Pa.
McIlhenny, J.S., Washington, D.C.
McIlhenny, J., Philadelphia, Pa.
McMillin, E., N. Y. City.
Miller, A.S., Long Island City, N.Y.
Miller, W. S., Cincinnati, O.
Mitchell, K. M., St. Joseph, Mo.
Moses, F. D., Chicago, Ills.
Neal, G. B., Boston, Mass.
Nettleton, C. H., Derby, Conn.
Norris, R., Philadelphia, Pa.
Page, C. H., Jr., Philadelphia, Pa.
Page, F. D., Fitchburg, Mass.
Pearson, W. H., Jr., Toronto, Ont.
Pinkney, E. A., Utica, N. Y.
Porter, J. F., Alton, Ills.
Pratt, E. G., Des Moines, Ia.
Prichard, C. F., Lynn, Mass.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., Philadelphia, Pa.
Raynor, C. H., Adrian, Mich.
Ringwood, T., Ilion, N. Y.
Roots, D. T., Connersville, Ind.
Ross, A., St. Louis, Mo.
Rusby, J. M., Jersey City, N. J.
Russell, D. R., St. Louis, Mo.
Searle, R. M., Johnstown, N. Y.
Shelton, F. H., Chicago, Ills.
Slater, A. B., Providence, R. I.
Slater, H. C., Milwaukee, Wis.
Slater, A. B., Jr., Providence, R. I.
Somerville, J., Indianapolis, Ind.
Stacey, J. E., Cincinnati, O.
Steck, H., Philadelphia, Pa.
Thompson, G. T., N. Y. City.
Thwing, O. O., St. Louis, Mo.
Vanderpool, E., Newark, N. J.
Walbridge, H. D., Grand Rapids, Mich.
Walters, A. H., Johnstown, Pa.
Warmington, G. H., Cleveland, O.
Weber, O. B., N. Y. City.
White, W. H., N. Y. City.
Williams, W. L., Paterson, N. J.
Young, J., Allegheny, Pa.
Young, R., Allegheny, Pa.

Associate Members.

Backus, Q. S., Williamsport, Pa.
Collins, D. J., Philadelphia, Pa.
Curley, E. J., Wilmington, Del.
Dart, E. M., Providence, R. I.
Dougherty, H. N., Brooklyn, N.Y.
Eaton, A. B., Chicago, Ills.
Henderson, E. H., Pittsburgh, Pa.
Hayward, S. F., N. Y. City.
Higgins, C. M., N. Y. City.
Knight, C. S., Fort Wayne, Ind.
Mordue, T. N., N. Y. City.
Norton, H. A., Boston, Mass.
Osius, G., Detroit, Mich.
Persons, F. R., Toledo, Ohio.
Platt, E. S., St. Louis, Mo.
Roper, G. D., Rockford, Ills.
Stratton, S. S., Chicago, Ills.
Van Wie, E. G., Detroit, Mich.

[A paper read before the Society of Gas Lighting.]

The New Four-Lift Holder of the New York Mutual Gas Light Company.

By Mr. Walter A. Allen, Engineer and Superintendent of the Company.

At your January meeting a paper[1] was read before this Society, descriptive of the foundation which had been prepared to support a gasholder having a capacity of 4½ million cubic feet, with steel tank, then being erected by Messrs. R. D. Wood & Co., of Philadelphia, for the New York Mutual Gas Light Company, at their works in East 12th street, New York city.

It will be recalled that the foundation was constructed on piles driven in an excavation made where four small pit holders had formerly stood. The piles were surmounted by a double timber coping. A circular wall was built to the ground level, and the space inside filled with gravel, the whole being covered with concrete.

The foundation was finished in October, 1895, and one year was to be allowed for the construction of the tank and holder, which were ready for use by October 1st, 1896, the contractors having thus anticipated the date agreed upon.

The entire structure is of steel, of the best grades procurable, exhaustive tests being made at the mills to determine its strength and suitability.

The base of the tank is about 6 inches above the ground level, which has a natural drainage. The tank is 195 feet inside diameter, and 40 feet deep, and contains about 9 million gallons of water. The bottom is of steel, and the space between the sheets and foundation was filled with a cement grouting. The shell of the tank is in nine rings or courses, each of 24 plates. The bottom course plates are $1\frac{3}{16}$ inches thick, 5 feet wide, and 25 feet long, and weigh about 8,000 pounds each.

These plates were so large that the Lukens Steel Company were obliged to prepare special ingots from which to roll them. The rivets are 1⅛ inches diameter, and to drive these the Messrs. Wood erected probably the most complete portable hydraulic plant that has ever been constructed. The ponderous riveter, weighing about 18,000 pounds, was handled with the greatest ease and rapidity. Probably the most remarkable part of this work is that they were able to keep such a plant in operation during the cold weather of last winter, the tank work being completed in February last.

The gasholder has a capacity of about 4½ million feet, and is in four telescopic sections, the diameter being 185 feet 3 inches, 187 feet 6 inches, 189 feet 9 inches, and 192 feet, respectively.

The holder sections are of slightly different depths, in order to place the goosenecks in the most compact way, and at the same time resist the strains that come upon them most effectively. The shell sheets are about 12 feet long by 39 inches wide, the object being to reduce the number of joints as much as possible and thus lessen the chances for leakage. The effect, too, is very pleasing to the eye, as it adds to the massive appearance of the structure. During the air tests the shells have been shown to be entirely free from buckles and absolutely tight, which latter fact may be attributed to the use of pneumatic machinery of special design for driving the cold rivets. Our experience has been most favorable to this method, for the work is not only uniform but of a character that will successfully resist tests that the hand work will not pass, and we thus overcame the possibility of variation in the character of the work because of the temperament of the individual workman. The Messrs. Wood are to be congratulated upon having accomplished so desirable an end, and as it is the first instance of successful machine work on the light shell sheets, we believe it to be the most important step that has been made. The large rivets about the top curb of the inner lift were all driven by hydraulic apparatus.

The crown has a rise of 12 feet at the center, the form being spherical. It is composed of metal sheets laid in successive circular courses, which are double riveted to insure tightness. The curve of the crown is true

1. See Journal, April 6 1896, p. 536.

and smooth and the tests with soap suds have proven it to be perfectly tight.

The guide frame is composed of 24 standards or columns, standing 160 feet above the walk around the tank, or 200 feet from the ground. The weight of the frame is supported by extensions to the columns, riveted to the tank shell beneath the walk, and continued to the ground, where they terminate in a graceful curve.

The columns are of the latest and most approved design of solid web plate girders, the chords of which are made up of two angles with a wide channel cover plate. In this construction all parts which are exposed to the action of the weather are accessible for painting, which is not the case with latticed columns.

There are six tiers of box-shaped, open-latticed girders, 144 in all. The intersections of the columns and girders are joined by diagonal tie bars of channel steel, which are tied at their intersection by a circular plate.

The guide frame was erected by a special hydraulic trammel or movable derrick, and the entire frame riveted with hydraulic apparatus especially adapted to this work. The guide rails are of 60-pound railroad steel, attached to the inner face of the columns by angles at intervals of a few feet. These angles or rail chairs are made positive by properly punching them, and are designed to resist both the radial and tangential loads that may come upon them.

There are 24 goosenecks, or guide brackets, on each lift at the columns, 48 friction rollers on the top of the second and third lifts, which bear against channel guides on the first and second shells, and 48 bottom brackets on the inside of each lift.

All of the rollers on the goosenecks, friction brackets and bottom or cup brackets, are adjustable positively by screws and jamb nuts, and all of the brackets are of steel.

The goosenecks each have a radial roller and two tangential rollers. The radial roller bears against the face of the guide rail and resists only radial loads, while the two tangential rollers bear against the sides of the rail and only carry tangential loads. There are 576 guide rollers on the four lifts, each independently adjustable. There are four 36-inch pipes for the inlet and outlet, and over the tops of these there are hoods on the crown, which have extensions on the inside of sufficient depth to seal off the pipes when the holder is down, so that a man can enter them in case of necessity without first purging the holder, or even landing the crown on its support. The crown support is built of southern pine and steel framing.

In each cup there are a sufficient number of patent overflows, which will carry the rain water and accumulation from condensed steam to the inside of the holder, and thus prevent the water running over the outside of the shells, where it would freeze in cold weather.

Two complete and independent heating devices will be placed on each cup and on the tank. These devices are very complete and unique, though I shall not attempt to describe them at present.

A steel stairway extends from the ground to the tank walk, and from thence up the entire height of the guide frame. It is arranged in eight easy flights, with ample landings and double hand rails, and adds not only to the convenience of ascending and descending, but very materially to the appearance of the structure. Ample and graceful rails have been placed around the top curb, on each grip on the tank walk, entirely around the top of the frame, and on such girders as need to be used for convenience in getting on or off of the crown or grips.

A special indicator will enable us to read, from a scale directly, the exact contents of the holder at any time, and a system of speaking tubes will extend from the governor house up to each of the stair landings.

All of the valves for operating the holder are confined within a small building with a Connelly governor. The building is octagonal in form, and we have endeavored to make it conform in as far as possible to the splendid appearance of the holder. It has an octagonal hipped roof, with a neat cupola surmounted by gilded pinnacle, and the interior has been elegantly furnished, the walls and ceilings being covered with pressed steel of ornate design.

The superstructure, with the water, weighs about 72,000,000 pounds, which, added to the foundation, brings a total load of about 65,000 tons on the 4,200 piles. The foundation has not shown the slightest sign of weakness in any particular, and we feel that it is there to stay despite some adverse criticism.

It is not my desire to praise the contractors so much as to bring before you the interesting details of one of the largest structures of its kind in America. The methods of construction were novel and unique in many respects, and Messrs. R. D. Wood & Co. deserve credit for its successful management and completion.

On the whole, the design is massive, but graceful and pleasing to the eye; and we consider it a masterpiece of its kind.

[Concluded from page 854.]

The Conversion of Culm into Gas.

[From a paper by Mr. N. W. Perry, before the Anthracite Coal Operators' Association.]

I have stated that gaseous transmission of energy is far cheaper than the electrical method. This is true, however, only for comparatively short distances. The cost of transmission increases far more rapidly with the distance than does electrical transmission. Comparing the increase of expense of transmission of the three methods mentioned with the distance, we find that by rail or boat the cost is practically proportional to the distance.

By electricity it increases as the square of the distance, and by gaseous transmission still more rapidly, so that although for transmission over comparatively short distances, the gas has an immense advantage over electricity, the latter finally gains the advantage as the distances are increased.

But to return to the culm pile: It is easily demonstrated that this material can be more advantageously transformed into power by converting it into gas and burning this in a gas engine than in any other available way.

To do this the most economical method is what is known generically as the Dowson gas process. This term is usually applied to all continuous water gas processes involving the simultaneous introduction beneath the grate bars of steam and air. The generator consists of a simple vertical shaft with some feeding arrangement and a sealed ash pit, in which pressure is produced by a steam jet. The resulting gas, cooled and cleaned by passing through a coke scrubber, has a calorific power about one-fourth that of ordinary 16-candle power illuminating gas. Such a structure involves an investment not to exceed $7 or $8 per horse power capacity, which is but little more than half as much as one would have to pay for the cheapest kind of boiler.

By the Dowson process about 160,000 cubic feet of gas can be obtained per ton of good anthracite, and the gas engine, even in small sizes, when using such gas will, under test conditions, give a brake horse power on 1 to 1¼ pounds of coal. This is better than the largest compound condensing steam engine can do.

In order that the gas may be stored and the generators worked continuously, at their maximum capacity, a gas tank or holder must be supplied, and this, though expensive per unit capacity when small, becomes very cheap as its dimensions increase. For instance, a 1,000 cubic foot holder will cost, erected, about $900 or $1,000, a 150,000 cubic foot holder about $15,000 and a 3,000,000 cubic foot holder $180,000. If we assume that 75 cubic feet of Dowson gas will produce one-horse power hour, the storage involves an investment of about $13 per horse power hour capacity in the 1,000 cubic foot tank; $7.50 per horse power hour capacity for the 150,000 cubic foot tank and $4.50 for the 3,000,000 cubic foot holder, as against about $35 per horse power hour capacity for the largest electric storage battery.

The gas engine cannot be bought so cheaply per horse power capacity as can the steam engine, but its economy in operation is so much greater as to more than counterbalance this deficiency. In large sizes I think it safe to put the gas engine investment at about $50 per horse power. The dynamo plant will involve an investment of about $20 per horse power, so that if we are to transmit our energy electrically we may assume the investment to be somewhat as follows:

	Per horse power.
Gas generators	$8.00
Tank	7.50
Engine	50.00
Dynamo	20.00
Total	$85.50

And if we are to transmit it in the form of gas, it will be but $15.50—not including real estate or buildings.

Now as to the transmission. We can transmit power electrically to any distance, and if the available voltage were unlimited, or the copper cost us nothing, we could make the loss in transmission as small as we choose. It is not thought practicable at the present time to use a higher pressure than 20,000 volts, though higher pressures have been used experimentally, and, unfortunately, copper and line construction are both expensive, so we are limited in all directions. It is in the province of the engineer to determine just how much loss in transmission will give him the best results, and this was stated generally by Sir William Thompson as follows: The expenditure in copper must be such that the interest on the investment will just equal the annual cost of horse power lost in transmission.

If more copper be introduced, so as to lessen the line losses, the cost of the power transmitted will be more, as it would also be if the attempt were made to economize on copper at the expense of the line losses. There is still another limitation, viz., the power when delivered must cost less than power generated locally or it will have no market. In the now famous Frankfort-Lauffen experiment, power was transmitted a distance of 100 miles with an efficiency of 75 per cent., but when it was delivered it cost five times as much as it cost to produce power locally.

It is evident, therefore, that if delivered power has to compete with very expensive local power, it may be transmitted much farther than if it has to compete with very cheap local power.

With the conditions existing in this part of the country, I do not believe that it is a commercial project to transmit power more than 25 miles at a potential of 20,000 volts.

Much has been said in the papers about the transmission of power from Niagara to Buffalo and even to New York, but conservative engineers have no idea that it can be done commercially to more than 20 to 25 miles, but if these distances can be exceeded at Niagara, they can by the same means in the coal regions.

If we decide upon gas transmission, it is almost impossible to state the limits of transmission. We can, of course, increase our pressure almost to an unlimited degree, but this means greater liability to leakage or very much more expensive pipe line construction.

Greater pressure means a denser gas, and this in turn means greater frictional losses. It is probable that under no conditions could gas be transmitted economically at one step to a distance of 25 miles where the power for forcing it along had to be produced artificially.

We have, however, this recourse with gas which we have not with electricity, we can divide the distance up into conveniently short sections, at the end of each of which could be placed an engine and pump as in oil transmission, and thus without going to prohibitive pressures with resulting leakages and additional friction losses, extend our transmission to considerable distances.

The most economical length of these sections would depend so much upon local conditions that I will not hazard even the roughest estimate how far energy may be thus economically transmitted. It is evident, however, that a limit must exist, for while the losses are decreased by multiplying the pumping stations, the investment charges are increased as well as the operating expenses.

In conclusion, I will say that from my study of the problem I am convinced that the ultimate solution of the problem of the utilization of anthracite culm lies in its conversion first into fuel gas, and the transmission of this directly to be burned elsewhere in gas engines, or by locating the gas engines at the culm bank, consuming the gas there and transmitting the developed energy thence electrically. Which will be best must be determined independently for each particular case. But in the culm pile you have a source of energy more immediately available than any but exceptionally situated water powers, requiring neither dam nor raceways, and only less inexhaustible than Niagara itself.

Explosions of Acetylene.

Engineering Magazine for December, in its "Scientific Miscellany," has this to say on the topic named in the heading:

Notwithstanding the assertions of interested parties that acetylene can be handled and stored without such risk as ought to obstruct its use as an illuminant, it is a matter of fact that there have been a number of explosions of acetylene. The circumstances under which these have occurred are not all of a nature to reassure doubters. The *Examiner* (Oct. 23) editorially reviews the list of explosions that have attended the recently increased use of acetylene. It says that "the scientists * * * who have been giving a good deal of attention to acetylene" have "approved of its use, if sufficient care were taken in its employment; and, with a view to securing perfect safety, a series of rules and regulations has lately been put in force."

It was, therefore, supposed that, if these rules were observed, all danger would be removed.

"Users have had their confidence severely shaken during the past few weeks by two explosions that have been attended with fatal results. First, an apparatus employed in a café at Lyons exploded, completely wrecking the premises, and killing two persons and injuring several others. Last week yet another accident took place, when a steel receptacle containing liquid acetylene exploded at the works of M. Raoul Pictet, Rue Championnet, Paris. A part of the works was blown down, two workmen were killed, and another injured, and not a pane of glass was left in the windows of the large block of buildings. The effect of the explosion was very much like that of dynamite. The unfortunate workmen were torn to pieces, and parts of their bodies were scattered about the yard. The flesh was blackened by a substance which had penetrated into the skin, and this has enabled the experts to formulate a plausible theory as to the cause of the explosion."

Now, Raoul Pictet is famous the world over for his skill in handling, compressing and liquefying gases. He is also a highly trained scientist, inventor and mechanican. When a man of this kind cannot manage acetylene without wrecking his property, it is little wonder that laymen should be timid.

At Lyons the explosion was caused by gaseous acetylene. In the Pictet works a steel receptacle of great strength, containing acetylene produced under a heavy constant pressure, burst, with the result above stated.

Contrary to the opinions of the greater number of experts, M. Pictet favors the distribution of acetylene in the liquid state, rather than the local manufacture of the gas from calcium carbide in an apparatus. "He argues that the danger arises solely from the impurities contained in the acetylene, and that these impurities must be removed by special processes before the acetylene can be liquefied without leaving a residue. He contends that another enormous advantage lies in the convenient and portable form of the acetylene receptacles, which may be conveyed any distance ready for use, and will, in course of time, be purchased at any store as required. There is, he asserts, less danger to be feared from liquid acetylene than from liquid carbonic acid, for this latter will only liquefy under pressure of 65 or 70 atmospheres, while acetylene requires a pressure of not more than 12 atmospheres. Nevertheless, there are 2 million carbonic acid cylinders circulating on the railways, and yet accidents from this cause are very rare. The experiments that have been made by MM. Berthelot and Vieille, the chief engineer of the French explosives department, would seem to bear out some of the arguments of Monsieur Pictet, but they still show that liquefied acetylene is more liable to explosion than the gas; and this has been repeatedly insisted upon by M. Berthelot, who has made several communications on the matter to the Académie des Sciences. They took two steel receptacles each of a capacity of about a liter, and filled one with gaseous acetylene under a pressure of 10 atmospheres, and the other with liquefied acetylene with a density of .3—that is to say, of 300 grams to the liter. The cylinders were dropped, first of all, from a height of 6 meters on to a steel anvil, and no explosion ensued. They were then broken by a hammer of 280 kilograms in weight, falling 6 meters.

"The compressed gaseous acetylene did not explode, but in the other cylinder an explosion took place after an almost imperceptible interval. This, it is supposed, resulted not from the pure acetylene, but from the mixture of the explosive impurities in the acetylene with the air the moment they were freed from the cylinder. The inflammation of this gas is believed to have resulted from the sparks flying from the pieces of the steel receptacle when it was broken. Then a wrought-iron bottle was taken, enclosing another containing gaseous acetylene compressed at 10 atmospheres. It was fired at with a gun, and the ball penetrated the outer bottle and dented the inner one. No explosion followed the shock. A similar bottle was then filled with liquid acetylene, and a charge of 1.5 gram of fulminate of mercury was fired inside. The bottle exploded with great violence, and the effects were exactly the same as with other explosives. It therefore appears that acetylene in its liquid form is much more liable to explode than in its gaseous state, even under a pressure of 10 atmospheres."

M. Pictet says that absolutely pure acetylene is obtained by his process. But either his process failed to produce pure acetylene, or his theory that pure acetylene is not explosive is not sustained. The material of which the cylinders are made is nickel steel, and they are tested to a pressure of about 3,750 pounds per square inch. The rupture of such a cylinder could be effected only by a mighty force, and its destructive power, when ruptured, would be tremendous. The fact remains, that carbonic acid requiring for its liquefaction five or six times as much pressure as acetylene is constantly handled on railways and in manufacturing establishments in large quantity, practically without serious accidents; and in precisely the same kind of cylinders as the one exploded at M. Pictet's works, and in which he proposes to distribute liquefied acetylene to consumers as a commercial illuminant. How can these apparently conflicting facts he reconciled?

It is supposed that the explosion was caused by one of the workmen in screwing in a plug, the heat thus generated igniting the liquid. The basis for this opinion is the presence of the black substance on the skin of the men injured, above alluded to. As this substance forms in

quantity only upon a considerable quantity of acetylene, it is inferred that the receptacle was full, and, it being usual to insert the plug when the filling is complete, it is therefore inferred that the plugging was in progress when the explosion took place. Evidently this is a mere guess, and still more evidently there is something yet to learn about acetylene.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A CORRESPONDENT forwards the following from Seattle, Washington, under date of the 27th of November: "Seattle has had a Pure Food Exhibition through the enterprise of the local Exchanges. It was a remarkably successful affair, and its prosperity was undoubtedly largely due to the clever efforts of the man who managed—Mr. L. W. Buckley, of Philadelphia. About every business interest in the city was represented at or in the various booths, but I presume your readers would have small concern about any other display than that made by the Seattle Gas and Electric Light Company, which really did the Company exceeding credit. Possibly the fairest way of describing the Company's show will be to reproduce the following description thereof, as the same appeared in the columns of the *Trade Register:* 'Booth No. 28.—The blaze of light at the booth of the Seattle Gas and Electric Light Company was a great attraction. The top was surmounted by a row of small gas jets, 3 inches apart, interspersed with the attractive Welsbach lights. The center was hung with lighted chandeliers and backed with many and various forms of lighting. The draping was white and pink, the entire structure being made of gas pipe. Inside was a variety of gas stoves on which various foods were cooked daily. A blaze of light and a most magnificent sight was this exhibit, and it is absolutely safe to say that not a man, woman or child visited the Exposition who did not look upon this feature of the display with delight. It required many men and a heavy expense to prepare it; but Mr. Collins, the Manager of the Company, was equal to the emergency. There were gas jets by the hundred, springing from perforated gas pipes, which had been arranged in a great framework, 20 feet long, 10 feet wide and 16 feet high. Within this structure of flame were arranged an almost endless number of gas lamps of every kind, and the main ones were of the remarkable Welsbach type. It leads all others. The beautiful colored shades made a most artistic display. For economy the lamp exceeds any other.' Adding a word or two more on my own account, I might say that the exhibition of gas stoves included types of all the well known sorts, and the demonstration cooking lessons were convincing in the last degree to the housewives of Seattle that cooking by gas is the proper thing. Manager Collins and his Company deserve credit for their part in the Pure Food Show—he for his cleverness in arranging the display and the close attention he gave it during the continuance of the Exhibition, and the Company for its liberality in providing the neceesary funds. It was money well spent, however, for the result is sure to be an increase in its gas output.—S."

ONE W. H. Young, formerly proprietor of the Windsor Hotel, Dayton, Ohio, was recently indicted by the Dayton Grand Jury for the larceny of $150 worth of gas from the Dayton Natural Gas Company. Subsequently, in the trial court, he pleaded guilty to the charge of petit larceny, which plea was accepted. He was sentenced to the Workhouse for a term of 30 days, also, to pay the costs of the proceeding.

AMONGST the numerous contracts recently awarded to the Berlin Iron Bridge Company, of East Berlin, Conn., for steel roofs covered with corrugated iron, lined with the Company's patent anti-condensation roof lining, is that for the new power station for the Stamford (Conn.) Gas and Electric Company. The layout of this station is very convenient and the construction is to be of the very best. The engine and dynamo room is 60 feet wide and 100 feet long, and the boiler room adjoining is 40 feet wide and 75 feet long. The walls are of brick, and the framework of the roof, as well as the supports for the travelling crane in the engine and dynamo room, is to be of steel. The Berlin Company has the contract for furnishing and erecting all of the structural steel work.

IT is reported that the International Meter Company, to manufacture gas meters in Chicago, has been incorporated by Messrs. James T. Osburne, Henry Flyton and C. E. Henderson. It is capitalized in $50,000.

RALPH THEOPHILUS, Secretary of the Electric, Gas, Light, Heat and Power Company, has notified the shareholders that a special meeting has been called for the purpose of considering a proposition to increase the capital stock of said corporation from $50,000 to $1,000,000. The meeting is to be held in the Carnegie Building, Pittsburgh, Pa., at 4 P.M. of the 10th inst.

THE proprietors of the Salt Lake and Ogden (Utah) Gas and Electric Light Company have issued the following notice: "We regret to inform our patrons that, owing to the failure of the New American Gas and Fuel Company's wells on October 28th, and to the fact that since that date we have received no gas from them, and also that the gas supply from the wells of H. L. Driver & Co. is too precarious to meet the demands of our consumers, we are obliged to cease to furnish natural gas, and on and after December 1, 1896, we shall supply manufactured gas only at the following prices: For gas for illuminating only, $2 per 1,000 cubic feet, net; for gas for illuminating and fuel, $1.75 per 1,000 cubic feet, net; for gas for fuel only, $1.25 per 1,000 cubic feet, net. These prices are to remain in effect until further notice."

THE Directors of the Shippensburg (Pa.) Gas Light Company have perfected the following executive organization: President, Dr. R. C. Stewart; Treasurer, E. J. McCune; Secretary, George B. Cole.

AT a meeting of the Directors of the Portland (Me.) Gas Light Company, it was voted that the following minute, respecting the memory of the Hon. William W. Thomas, be placed upon the records of the Company:

"The late Hon. William W. Thomas was long a member of the Board. Here he commanded the respect of his associates, not less by his uniform courtesy and kind consideration than by his wide experience and venerable age.

"Full of years and honor, he has passed on to rest. Multiform interests that he served in life will mourn his loss, yet there remains to the community which reaped so much from his long and useful labors, the rich heritage of his sagacious counsels, of his unsullied character, and of the inspiration of his high example in the promotion of all good works."

THE Philadelphia Councils' Committee on Gas is at work on the appropriation for the Gas Bureau for the ensuing year. In the initial or preliminary discussion, on motion of Mr. Buchholz, the pay of the meter inspectors was ordered increased from $840 to $900 per annum; and it was also decided that the pay of other employees should be increased. During the discussion it was asserted that, apart from the money appropriated for the storage holder at the Point Breeze station, only $54,000 had been allowed for extensions in two years. An item of $200,000 for main extensions was in the bill this year, and Mr. Quick asserted that if the $1,000,000 for this purpose in the "general loan bill" was not made available early in the year, the $200,000 item in the annual appropriation should certainly be allowed. Chief Park was quoted as having said that they had been obliged even thus early to distribute the gas at a pressure higher than any ever carried before, and even under this condition the supply at points distant from the works was not what it should be.

THIS mention might reasonably be followed by this striking comment from a recent issue of the Philadelphia *Ledger:* "The money loss resulting from leakage of gas from the mains would justify the use of Dominie Sampson's favorite word, 'prodigious.' To bring the case into forcible form, it may be formulated into these queries: What would be thought of a manufacturer or merchant who built a tank, and during the day filled it with illuminating gas, at a cost of over $1,600, and who found at the approach of evening that every foot of it had leaked away? Who the next day should do the same thing with the same result, and so on day after day, summer and winter, for years, without a remedy? What would be thought of his business qualifications? The city of Philadelphia has done practically that very thing for 10 years past; is doing it to-day. Taking the official reports of the Bureau of Gas for the past 10 years, 1886 to 1895, inclusive, and putting gas at present prices, $1 per 1,000 cubic feet, the city has lost over $5,750,000 in 10 years by leakage, and it must be noted in this connection that there has not been the regular per centum of increase which one would look for from increasing weakness of the distributing system, for the leakage dropped from 470,736,019 cubic feet in 1888 to 399,342,299 the following year, and there was a drop of 27,000,000 feet in 1891 from the leakage of 1890, while it jumped from 632,873,186 feet in 1893 to 1,300,856,929 in 1894, with a decrease again in 1895 of 1,700,000. For the past 5 years the leakage has been amounting to over 2,000,000 feet per day, which is to say there is a loss of $2,000 per day on this account, or an aggregate of $2,666,000 in 5 years; and last year, and presumably at present, the loss from leakage costs the city $3,000 a day."

THE final meeting of the shareholders of the Halifax (N. S.) Gas Light Company, convened for the purpose of winding up the business of the Company and to arrange for the actual transfer of its properties to the proprietors of the Peoples Light and Heat Company, was held about a fortnight ago.

THE Directors of the Portland (Me.) Gas Light Company have declared a dividend of $2.50 per share, payable on demand.

SUPT. ZEEK says he is perfectly satisfied with the way in which the new generating apparatus for the Pensacola (Fla.) Gas Company is working.

A CORRESPONDENT forwards the following from Springfield, Mass.: "The proposed formation of a Board of Trade for West Springfield has aroused no little speculation as to what such an organization could do, and it is the general opinion that there is much need of such an organization. One matter has been suggested which it might accomplish—the untangling of the snarl between the Selectmen and the Springfield Gas Light Company, which supplies gas to a part of West Springfield. After the main line was laid the Company wanted permission to dig up the streets for the lateral lines, and also to extend its mains down Park avenue and up Elm street as far as Meeting House hill. The Selectmen thought that they ought to enter into some agreement so that the town could buy at cost the plant of the Company; later, on further investigation, they thought it would be fairer to the Company if the town agreed to pay for the pipe at a price not exceeding the cost, and 6 per cent. on the money invested up to the time of taking the plant. The Gas Company, however, flatly refused to enter into any compact outside of the conditions laid down in the State law. These provide that, on petition, the court shall appoint a commission to decide as to the value of the plant and set the price; but, probably because of their experience with a commission who valued the recently acquired aqueduct, the Selectmen declined to enter into the proposition, consequently there are no extensions of gas lines. Meanwhile the citizens are waiting for gas, and it cannot be obtained; one or two tenement owners have lost chances to rent their tenements owing to the fact that gas could not be secured."

THE new proprietors of the Woburn (Mass.) Gas Light Company have authorized the announcement that, on and after January 1st, 1897, the price charged shall be billed at $1.80 per 1,000 cubic feet, prompt payment to entitle the consumer to a rebate of 30 cents per 1,000—the discount period runs until 15 days after the presentation of the account. The ruling rate is $1.80 per 1,000, less 20 cents for prompt payment.

THE plant and franchises of the Port Huron (Mich.) Fuel Gas and Light Company were to have been sold at auction on Tuesday last, but we have not been advised that the sale was completed. This is the opposition concern that was organized some years ago by George Wilson, of Pittsburgh, Pa.

THE suit of James Brady, against the Consolidated Gas Company, of Baltimore, Md., for $10,000 damages for the death of his daughter, was decided in the Baltimore Court of Common Pleas on November 26th. The girl was suffocated by gas that escaped into the cellar of the premises, No. 619 Chase street, Baltimore, on October 11th, 1893. Judge Wright ordered a nonsuit on the ground that the testimony did not show that the escape of gas was caused by negligence on the part of the Company. Mr. Charles Morris Howard appeared for complainant, and the Company's interests were represented by ex-Judge Wm. A. Fisher and J. Alexander Preston.

MR. E. R. ELLSWORTH has been appointed Superintendent of the gas plant at West Upton, Mass.

THE Fort Wayne (Ind.) Gas Company has opened a branch office at Ossian, which is under the management of Mr. Keefer, editor of the Ossian *News*.

THE new works of the Oneida (N. Y.) Gas Company, which are located on Scanandoa street, will be in working order before the Christmas holidays. The capacity of the plant is 60,000 cubic feet per diem.

H. C. GAYLORD, an itinerant meter inspector in the employ of the Hoyt Inspection Company, is wandering through Connecticut. He visited Derby and Ansonia towards the close of November, but did not stay there long, for, as the consumers had no complaints to make about their meters, there was nothing for him to do. We believe he did "test" two meters, both of which were shown to be well within the legal limits. In reporting his arrival and departure, the Ansonia *Sentinel* took occasion to say that Gaylord "complimented the honesty and efficiency of the management of the Derby Gas Company." Meanwhile we might suggest to Gaylord that he be careful in his wanderings through Connecticut, for some of the gas proprietors of that State might be inclined to question the legality of his acts in meddling with property of which they are sole owners.

THE new holder for the Hornell Gas Company, of Hornellsville, N.Y., is rated to a capacity of 100,000 cubic feet. That it will be put in duty as speedily as possible will be at once understood when it is said that Superintendent Summers is sending out 50,000 cubic feet per day, the available storage capacity being not in excess of 22,000 cubic feet. President Morris and Superintendent Summers are not having many idle moments just now, for the other improvements on the works and mains to every intent mean the reconstruction of the same; but their hours of profit, if not of ease, are bound to come with the completion of the tasks in hand.

THE Board of Aldermen, of Richmond, Va., are wrestling with the problem of retrenchment and reform, for it seems that the city's expenditures are in excess of its receipts. How to at least balance the two is the question, and one proposition looking to that end was submitted by Mr. Carter and abetted by Mr. Blake. They thought it would be a good idea if the city increased the gas rate from $1 to $1.25 per 1,000 cubic feet; and the unfairness of the proposition never impressed them in the slightest degree. A just plan that, which would seek to impose upon the gas consumer the task of paying an undue proportion of the taxes of the non gas consumer!

DEATH from asphyxiation by illuminating gas, inhaled while the insured was asleep, was held, in the case of the Fidelity and Casualty Company vs. Waterman (Illinois, 32 L. R. A., 654) to be not covered by the clause in the policy excluding injuries from poison, "or anything accidentally or otherwise taken, administered, absorbed or inhaled."

MR. JAMES MEANS, in an article recently published by him in pamphlet form, on the subject of "Twentieth Century Energy," says that there have already been issued from the United States Patent Office more than 800 patents on engines working by explosion within the cylinder, and declares that he has in his possession drawings and specifications of 71 United States patents granted in the past 10 months of 1896 in the gas engine sub-class. From these figures he assumes that the tremendous activity thus shown in this line of invention must be significant to those who are thinking of investing money in steam engines.

PERSISTENT, practical methods are bringing about the rapid extension of the use of gas for other purposes than lighting in Norfolk, Va.

Hints for Wiremen.

Locating a Ground.—A ground is the result of a partial contact between one wire and the earth or gas fittings, etc., or due to the filtering of current through the entire insulation on account of its poorness. A ground due to contact with one leg of the line may, if tested, be a high resistance ground, or a low resistance ground.

If a low resistance ground, the extremity of the ungrounded leg and a gas pipe will be able to supply sufficient pressure to light a lamp. Otherwise the high resistance ground can only be located by means of a Wheatstone bridge.

Drop in a Wire is calculated by a very simple rule—

$$\text{Drop in volts} = \text{current} \times \text{resistance}.$$

If a wire carries 10 amperes and has $\frac{1}{10}$ of an ohm resistance, the volts lost are equal to

$$10 \times \tfrac{1}{10} = 1 \text{ volt}.$$

The Resistance of the Wire may be found by estimating its length and referring to the wire table for the ohms resistance per 1,000 feet. If 1,000 feet equal 2 ohms, 100 feet equal

$$\frac{100}{1{,}000} \times 2 = \frac{1}{5} \text{ohms, etc.}$$

The Right Size of Wire for a Circuit is found by this rule—

$$\text{Circular Mils} = \frac{\text{Distance} \times \text{No. of Lamp} \times 10}{\text{Volts Drop}_1}$$

for a simple 2-wire circuit. For a 3-wire circuit divide by four. *A line 100 feet long*, carrying 100 lights with 2 volts drop, must be of the following size:

$$\frac{100 \times 100 \times 10}{2} = 50{,}000 \text{ Circular Mils; or, a No. 5 B. W. G.}$$

With a 3-wire system the size required would be—

$$\frac{50{,}000}{4} = 12{,}500 \text{; or, No. 11 B. W. G.}$$

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

A Supplement to the Discussion Before the American Association on Inclined Retorts Up-to-Date.

26 HAMILTON AVENUE, NORFOLK, VA.,
Nov. 24, 1896.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Since circumstances prevented an intelligent reply on the part of the author to some of the papers read in the discussion of the paper on "Inclined Retorts Up-to-Date" (AMERICAN GAS LIGHT JOURNAL, *ante* page 802) at the recent meeting of the American Gas Light Association, permit me to supply the deficiency through your columns, which course may be especially desirable, because many of your readers who are not members of the Association would probably not see the "Year Book," in which the full proceedings at that meeting shall be published.

On the whole Mr. A. C. Humphreys is to be complimented upon his able and really favorable report concerning the "slopers," for if carefully analyzed it cannot fail to aid the good cause of what may be called, if you please, retort house reform. But there are some of the statements which Mr. Humphreys makes which require an answer. Mr. Humphreys says: "So complete have been some of the failures, both in Europe and this country, that it undoubtedly rests with the friends of the new system to completely demonstrate that it has been developed beyond the experimental stage."

In this sentence Mr. Humphreys utterly ignores the well authenticated facts which are presented in the paper under discussion. If the reader will kindly look over that paper a favorable verdict cannot be avoided, and unless the truth of the statements therein made can be successfully assailed it must be that the "slopers" are long ago beyond the experimental stage, and that there is nothing left to demonstrate for the friends of this old-new system excepting it may be the wilful blindness to, and ignorance of, its manifest advantages by many who could reasonably be expected to know better. More could be said in this connection, but probably it is not necessary. Yet, in further reply to that particular sentence of Mr. Humphreys' argument, the reader is also referred to the account of the recent installation of "slopers" at Cassel, which was described in the AMERICAN GAS LIGHT JOURNAL, issue of August 17, 1896, page 253.

A sentence of Mr. Drory's letter, of February 22, 1896, may be here repeated, viz.: "We have already produced 19,500 to 21,000 cubic feet of gas per retort and per day (four hours' duration of charges), the fuel having not exceeded 11 per cent. on coal carbonized by weight." There is no speculation in possibilities in that statement. Mr. Drory's address is as follows—he is now the Chief Manager of the Berlin Station of the Imperial Continental Gas Association: E. Drory, Esq., The Imperial Continental Gas Association, Gitschiner Str., No. 19, Berlin, S. Germany.

The point concerning cost of land, made by Mr. Humphreys, is well taken, and must, of course, be considered. It was not forgotten by the author; but as the value of land differs much more than the cost of construction, and as any one desiring to build would apply that item according to locality, it was not included in the *comparative tables* forming a part of a paper, which it was apprehended was already too long; though even then it could not do full justice to that important subject.

For a like reason, the detail of foundations was not gone into. The latter were not mentioned by Mr. Humphreys, though it is just possible that that would explain why the Vienna "slopers" cost, for instance, $5,787 each, whereas our's at St. Louis, erected on a bed rock foundation, cost much less. The latter statement may be taken in explanation of other points which are made by Mr. Humphreys bearing upon the subject of cost of construction. Concerning the cost of coal benches, the writer based his figures on what such work had been done for repeatedly in his own experience; but the minimum price was stated in order to give the old horizontal system every possible advantage over the "slopers," and *then* show that the old system was "not in it, a little bit," with the "slopers" in the end. Mr. Humphreys' statement as to cost of coal benches is nearer right to present conditions, and this adds additional attraction to the advantage of this great improvement in retort house construction, viz., the "slopers." Mr. Humphreys is quite right in his statements concerning the comparisons of cost shown in Tables 16, 17 and 18, and his remarks bearing upon that subject meet with the full endorsement of the writer; but the author did not have the remotest desire to be unfair to water gas. Knowing that the large majority of the members of the Association represented works more nearly of the capacity of the one selected for example, the comparison objected to was made, mostly with the object of bringing the subject nearer home, and also with the expectation of eliciting profitable discussion, for there was a time when there was some doubt on part of officers of the Association that a sufficient number of papers could be secured for the St. Louis meeting.

Concerning Table 18, however, the writer is able to state that the cost of "slopers" mentioned therein, was based upon data received from competent authority in England. And those benches could have been erected at the time the table was constructed, notwithstanding whatever the cost of settings of nines was at Vienna, some years before.

It must be deemed fortunate that the paper criticized did not attain perfection, else the additional testimony in favor of the "slopers," given by Mr. Humphreys, would not have been brought out, and his admirable and interesting article might not have been written.

Now, as to Mr. Thompson's remarks: These were replied to at the meeting; but, because of the reasons stated at the beginning of this letter, it is hoped you will kindly publish the following for the benefit of your readers who are not members of the American Gas Light Association. Station "B" of the Laclede Gas Light Company, was designed and erected by Mr. Wm. Farmer, so well and favorably known, and affectionately remembered by the older members of the profession. The retort house was built on the rock floor of what was once a quarry, and the charging floor was raised sufficiently high above the level of the yard, to insure the benches from interference with extraordinary floods—if the uninformed reader will refer to Mr. Miller's paper on "A Modern Retort House,"[1] he will see what some of these Western rivers are capable of, when on a boom. The elevation of the charging floor necessitated that all the coal used be elevated about 14 feet above the level of the coal shed. Also, men had to be employed to quench the coke and cart it (during 9 months of the year) and pile it up outside of the works.

In due time, the substructure erected by Mr. Farmer for the benches, as well as the ovens, had to be renewed. The former were quite costly; and as, for a number of reasons, it was believed by the managers of the Company that there would be no more floods such as had caused the earlier lofty construction, instead of rebuilding the substructure it was entirely removed, and the stage floor became a ground floor retort house. This did away with some labor formerly necessary to raise the coal and quench the coke, as the latter was done by the regular retort house force. A coke contractor removed all the surplus coke at his expense; cheap coal was used for heating the benches instead of coke (introduced at said works by the writer), and thus economies were brought about at that particular station which were not taken into account in Table No. 8, mainly, however, because Table No. 7 gave the figures concerning a well-managed ground floor retort house, though only settings with 3 large retorts each were used there. Feeling confident that Mr. Thompson did not wish to adversely reflect upon the former management of the works he quoted, it yet seems but fair to report the whole story here as *it was at the meeting*, and where Mr. Thompson admitted the same to be correct.

Concluding, let me once more assure the readers of the AMERICAN GAS LIGHT JOURNAL that "slopers" are no longer in the experimental stage, for the statements published in the paper "Inclined Retorts up-to-Date," were well-fortified by many letters from eminent foreign gas engineers, which letters could not well be published, unless a book, not a mere paper, had been the aim of the writer in his entirely disinterested effort to bring this valuable (to gas companies) improvement before the gas profession in general. Very respectfully,

FREDERICK EGNER.

[Mr. Egner desires us to add that the letter from Mr. Drory, as printed in the JOURNAL for Nov. 23d, page 804, par. 4, should read "after 8 years of careful study," etc., instead of "3 years," etc.]

1. See JOURNAL, *ante*, p. 848.

The Market for Gas Securities.

The market for city gas shares was in a decidedly unsettled state last week, Consolidated having sold down to 158 ex-dividend of 2 per cent. Towards the close, however, a better feeling was developed, and the opening to-day (Friday) was reported at 163 to 163¼. The negotiations that have been going on between certain of the Companies have been carried on with much secrecy, but it seems likely that a fair understanding has been reached. The disturbing factor in the situation is said to be the likelihood that the Aldermen will grant the franchise for a fuel gas company to one of the applicants now before them for such a concession, but that possibility need not cause any great uneasiness, since it is reasonably sure that the Mayor, who is decidedly opposed to any further disturbance of the streets, will veto any grant of the nature proposed. New York and East River is strong, at 46⅓ to 47⅓, and other city shares are steady at last week's figures.

In out-of-town securities, Brooklyn Union is dull and strong, and Chicago gas is about 3 points higher. The belief in respect of the gas situation there, that comparative harmony is about to be restored, and that consolidation will shortly be legally accomplished, seems to be well founded, in which event Chicago is certainly worth at least the figures now quoted. The situation in Bay State gas is unchanged, and although the outlook for it is uncertain, we nevertheless believe that higher prices in it are to rule. Baltimore Consolidated shows no marked change, and Laclede common is dull and lower. Indications, however, go to show that bottom figures in it have been reached.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 Wall St., New York City.

Dec. 7.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	163	163¼
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	210	215
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	240	250
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
Northern	150,000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	46½	47½
Preferred	2,000,000	100	77	77½
Bonds 1st 5's	3,500,000	1,000	104	105½
" 1st Con. 5's	1,500,000	..	95½	96
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	84	87
Preferred	5,000,000	100	108	110
Bonds, 1st Mortgage, 5's	1,500,000	1,000	109½	..
Yonkers	299,650	50	180	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	92	94x
" " Bonds (5's)	15 000,000	1,000	105½	106¼
Bay State	5,000,000	50	10⅞	11
" Income Bonds	2,000,000	1,000	25	30
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000		76
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	76¼	76½
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	..	65
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	75	85
" Bonds	600,000	1,000	99	101
Cincinnati G. & C. Co.	7,000,000	100	201	202
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	30
Bonds (6's)	150,000	1,000		
Consolidated, Baltimore	1,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	32	33
" Con. Bonds	4,312,000	..	..	82
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	84	86
" Bonds	2,000,000	..	85	90
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	128	135
" Bonds, 6's	2,650,000	..	103	105
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	82	86
Bonds	1,000,000	1,000	85	90
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	22	22½
Preferred	2,500,000	100	72	80
Bonds	9,034,400	1,000	93	93½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	93	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	52	53¼
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150.000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10.000,000	100	97¾	98¼
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	
Washington, D. C.	2,000,000	20	250	
Western, Milwaukee	4,000,000	100	63	65
Bonds, 5's	3,556,000	.	90	93
Wilmington, Del.	500,000	50	180	182

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DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY,
40 WALL ST., NEW YORK CITY, Nov. 12, 1896.

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable on Dec. 10, 1896, to stockholders of record at the close of business Nov. 30. The Transfer books of the preferred stock will be closed from Dec. 1 to Dec. 10, both inclusive. Checks will be mailed.

1120-3 EDWARD C. LEE, Treasurer.

ENGAGEMENT DESIRED.

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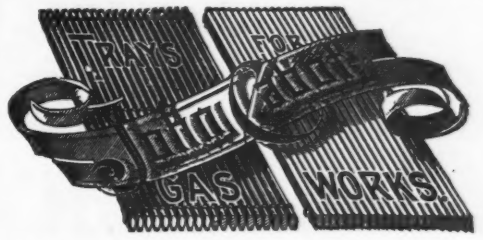

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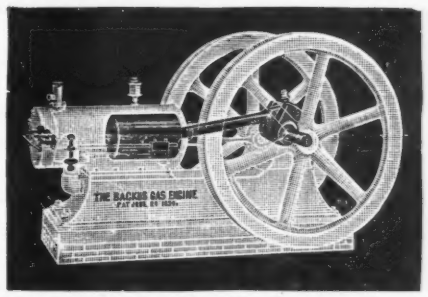

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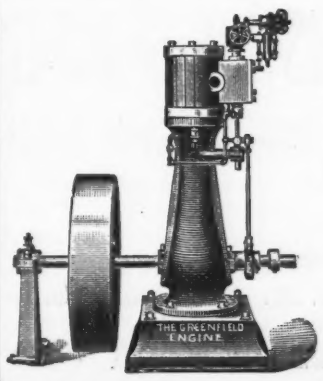

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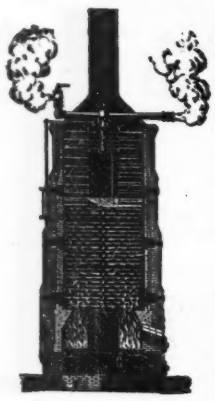

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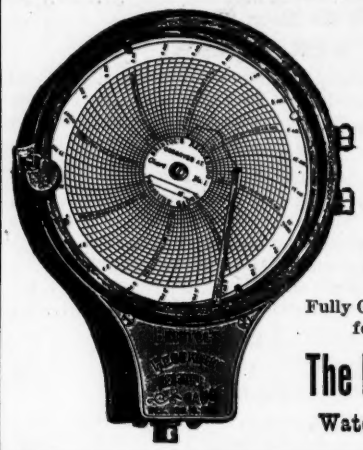

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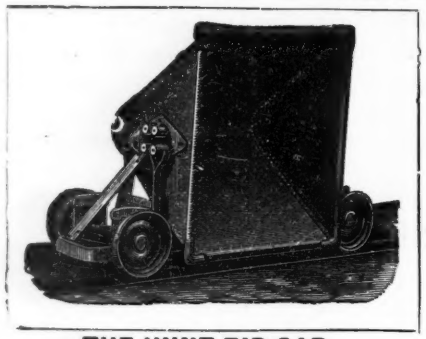

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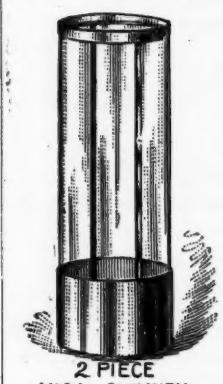

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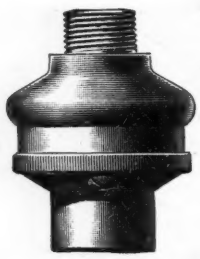

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PROSPECTUS.

THE object of the **Gas Exposition** is to bring together a collection of gas apparatus and appliances of every description, for the two-fold purpose of affording the general public and the gas engineer an opportunity to study the developments that have taken place in the gas industry during recent years. In submitting the plan of the Exposition to those who may feel an interest in the project, the management would call the attention of manufacturers of supplies of every description, entering into the manufacture of gas, to the great benefits which similar affairs have conferred on the industries of Great Britain, Germany and France, in which countries the exhibitions of gas appliances are held with recurring frequency. The creation of a healthy public sentiment in favor of gas is one of the first aims of large numbers of foreign gas companies.

MADISON SQUARE GARDEN.

In the selection of New York for the inauguration of an enterprise of this character, it is believed that no mistake has been made. In this city the Madison Square Garden is looked upon as one of the great show places of the metropolis; it contains within its walls the requisite space for the proper display of an almost unlimited amount of product, without which an affair of this kind cannot hope for the stamp of public approval—hence the selection of this great building for the inauguration of the gas industries exposition during the two weeks beginning January 25, 1897.

The greater New York contains a resident population of 3,000,000 people. Within a radius of 50 miles of Madison Square Garden live 4,500,000 people; reliable statistics show that an average of fully 100,000 strangers visit New York every day in the year. Thus it will be seen that the gas exposition will draw from a population of fully 6,000,000. In this connection it ma be stated that every effort will be put forth that ingenuity can devise to thoroughly advertise the exposition, and create a desire in the minds of the public to come to the show; and once within its portals the dazzling brilliancy there abounding, coupled with the many attractive and instructive exhibits, will cause the visitor to wish to come again.

It is expected that cooking demonstrations will be a feature of the exposition. The lecture and concert hall, situated conveniently near the great amphitheater, in which the exposition is to take place, affords seating room for 1,200 to 1,400 people. The most experienced and talented ladies obtainable will be selected for this feature of the affair, which must prove one of the show's greatest attractions; not only for the housewives who may be attracted to it, but for gas managers, who will thus have an opportunity to study the advantages these gas cooking demonstrations offer as one of the means at hand for the education of people in the uses of gas.

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On September 23d the United States Circuit Court for the Southern District of New York granted an injunction restraining and enjoining the further infringement of our Welsbach patent. READ IT.

UNITED STATES CIRCUIT COURT,
Southern District of New York.

WELSBACH LIGHT COMPANY,
vs.
A. LIEBES.
} IN EQUITY.

The President of the United States,

To A. LIEBES, and his servants, agents, attorneys and workmen, GREETING:

WHEREAS, It has been represented to us in our Circuit Court of the United States for the Second Circuit and Southern District of New York, that Letters Patent of the United States No. 438,125, were issued in due form of law on the 7th day of October, 1890, to Carl Auer von Welsbach, assignor of the complainant, then known as "Welsbach Incandescent Gas Light Company of New Jersey," and that the complainant herein is the owner of said Letters Patent, and that you, the said A. Liebes, have infringed the rights secured by the aforesaid Letters Patent, by making, using and selling to others to be used, incandescent devices for gas burners, embodying and containing the invention and improvements described and claimed in said Letters Patent No. 438,125.

NOW, THEREFORE, We do strictly command and enjoin you, the said A. Liebes, and your attorneys, agents, servants and workmen, under the penalties which may fall upon you in case of disobedience, that you forthwith and forever desist from directly or indirectly making, or causing to be made, delivering, vending, or causing to be sold, offering for sale, using, or causing to be used in any manner, any incandescent devices for gas burners, like, or similar to those which you have heretofore made, used or sold, containing or embodying the invention and improvements described in said Letters Patent No. 438,125, and claimed in the claim thereof, and from counterfeiting or imitating the said invention or improvements or any part or parts thereof, and from in any manner or way whatsoever, violating or infringing the said Letters Patent No. 438,125 and the claim thereof, and from doing, or causing to be done, any other act or thing whatsoever in infringement of the said Letters Patent No. 438,125.

WITNESS, The Honorable Melville W. Fuller, Chief Justice of the United States, at the City of New York, in the Southern District of New York, this twenty-fourth day of September, A. D., 1896.

(SEAL) JOHN A. SHIELDS, Clerk.

(Endorsed) U. S. Circuit Court, Southern District of New York, in Equity.—Welsbach Light Company vs. A. Liebes. Injunction.

A Copy of a Writ of Injunction this day issued out of my office. JOHN A. SHIELDS, Clerk.

We shall proceed against all infringers; manufacturers, dealers and users being equally liable to injunction and damages. The decree of the court awarding the injunction also awards profits and damages. Do not be misled or deceived by guarantees offered by infringers, as such guarantees will not protect you against suit, injunction and damages. For your own protection see that you get the genuine Welsbach light. All other incandescent gas lights are infringements.

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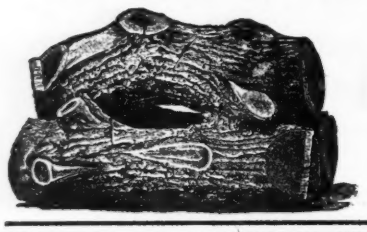

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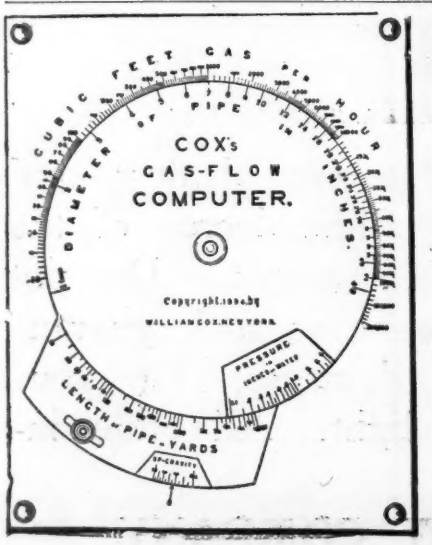

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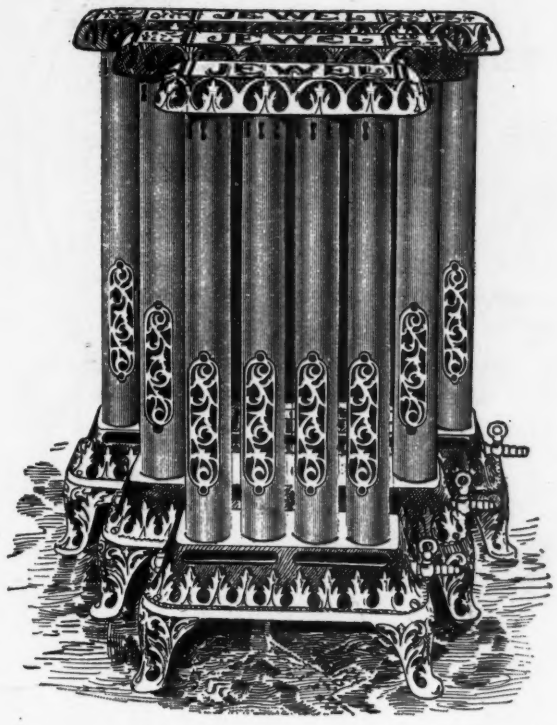

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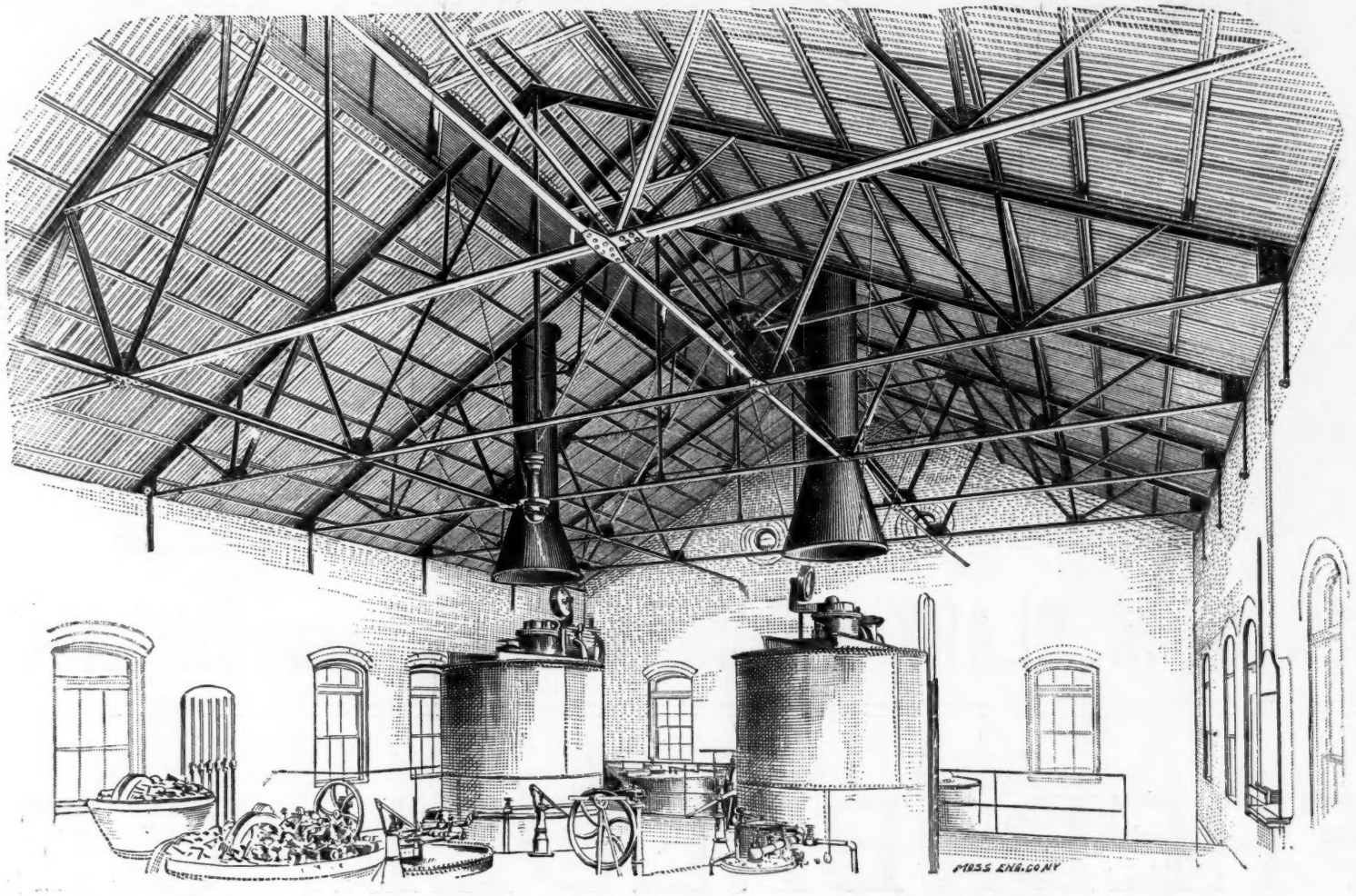

The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Providence Gas Light Company at Providence, R. I. The building is 40 ft. in width by 100 ft. in length, the side walls being of brick and the roof being entirely of iron—that is, iron trusses and iron purlins covered with corrugated iron. The building is ventilated by our Improved Ventilators, extending the full length of the roof, with side shutters opened and closed by cords from the floor. No woodwork is used in any way about the construction of the building.

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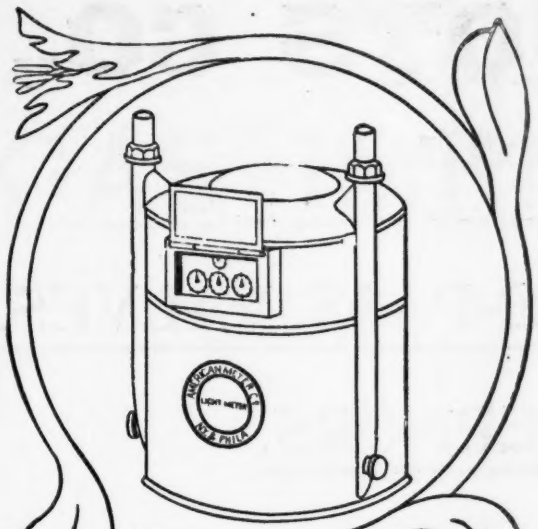

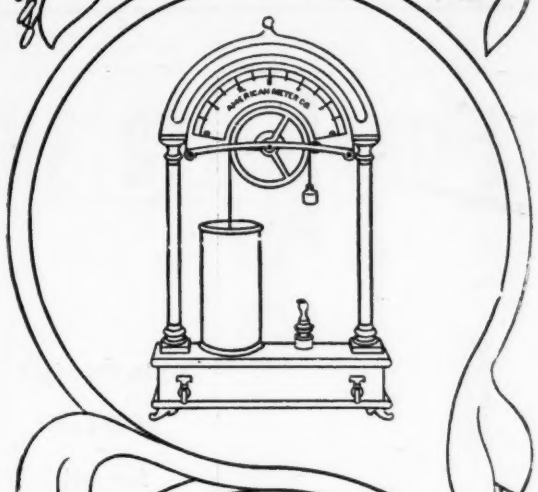

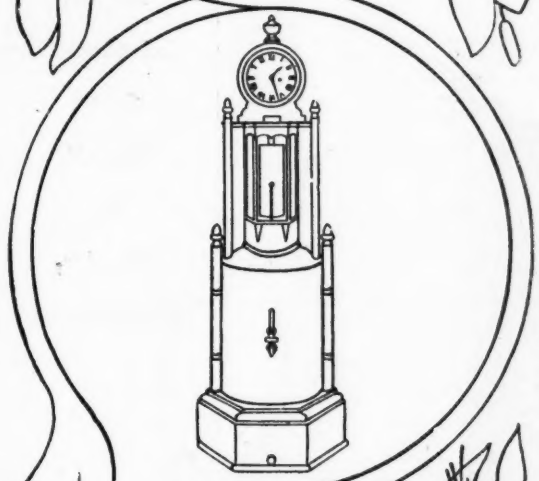

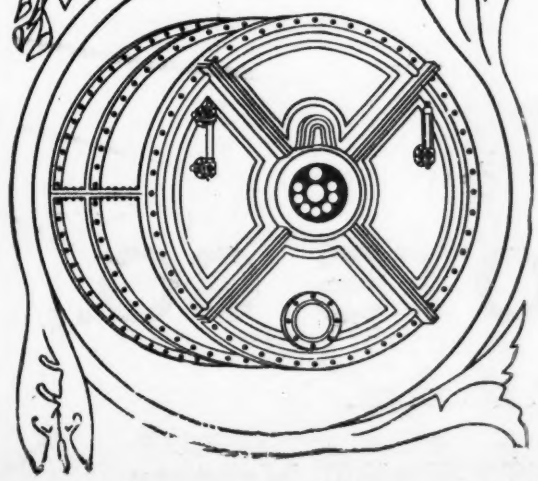

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NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

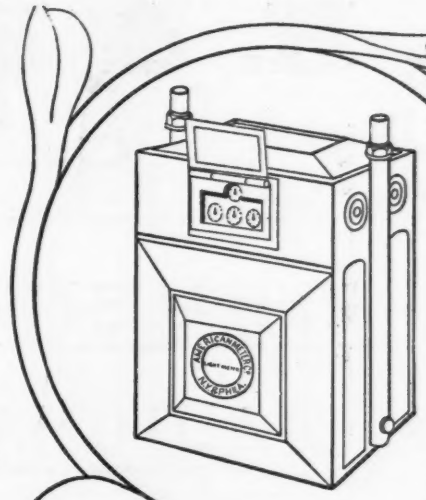
PUBLIC LIGHTING TABLE.

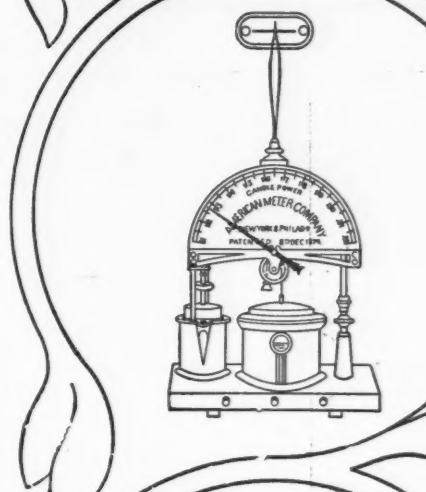
DECEMBER, 1896.

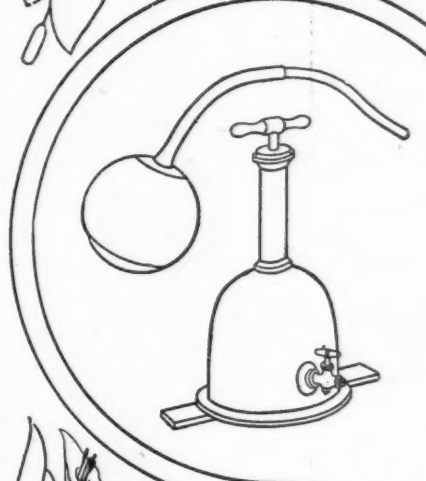
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Tue.	1	5.00 PM	6.10 AM	4.20	6.10
Wed.	2	5.00	6.10	4.20	6.10
Thu.	3	5 00	6.10	4.20	6.15
Fri.	4	5.00 NM	6.10	4.20	6.15
Sat.	5	5.00	6 10	4.20	6.15
Sun.	6	5.00	6.10	4.20	6 15
Mon.	7	5.00	6.10	4.20	6.15
Tue.	8	5.00	6.10	4.20	6.15
Wed.	9	9.00	6.10	4.20	6.15
Thu.	10	10.00	6.10	4.20	6.20
Fri.	11	11 00 FQ	6.10	4.20	6.20
Sat.	12	12.00	6.10	4.20	6.20
Sun.	13	1.00 AM	6.20	4.20	6.20
Mon.	14	2.00	6.20	4.20	6.20
Tue.	15	3.00	6.20	4.20	6 20
Wed	16	4.10	6.20	4.20	6.20
Thu.	17	5 10	6.20	4.20	6.20
Fri.	18	No L.	No L.	4.20	6.20
Sat.	19	No L. FM	No L.	4.20	6.20
Sun	20	No L.	No L.	4.20	6.20
Mon.	21	5.10 PM	7.00 PM	4.20	6.20
Tue.	22	5.10	8.10	4.20	6 20
Wed.	23	5.10	9.20	4.20	6.20
Thu.	24	5.10	10.30	4.20	6 25
Fri.	25	5.10	11.40	4.20	6.25
Sat.	26	5.10 LQ	12.50 AM	4.20	6.25
Sun.	27	5.10	2.00	4.20	6 25
Mon.	28	5.10	3.20	4.20	6.25
Tue.	29	5.10	4.30	4.20	6.25
Wed.	30	5.10	6.20	4.20	6.25
Thu.	31	5.10	6.20	4.20	6.25

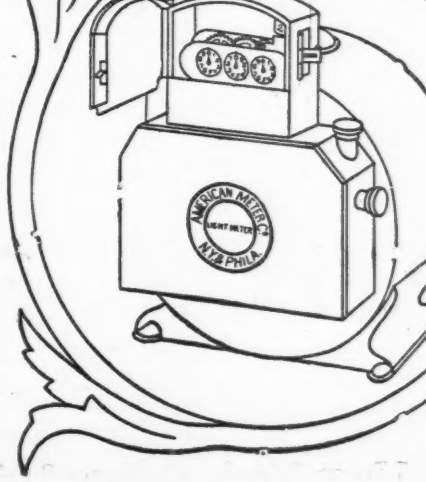
TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	220.40	January	423.20
February	207.00	February	367 40
March	193.00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142 10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00









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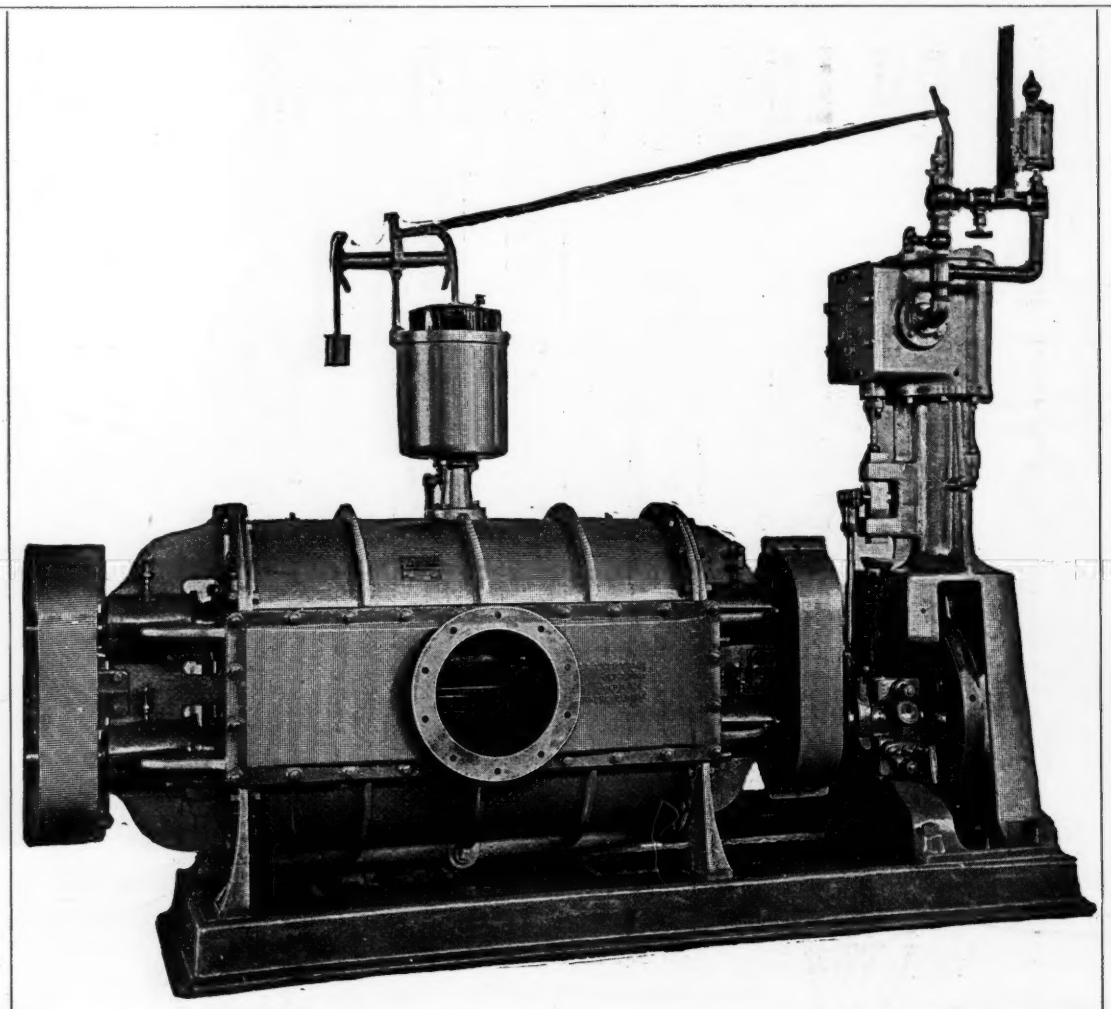

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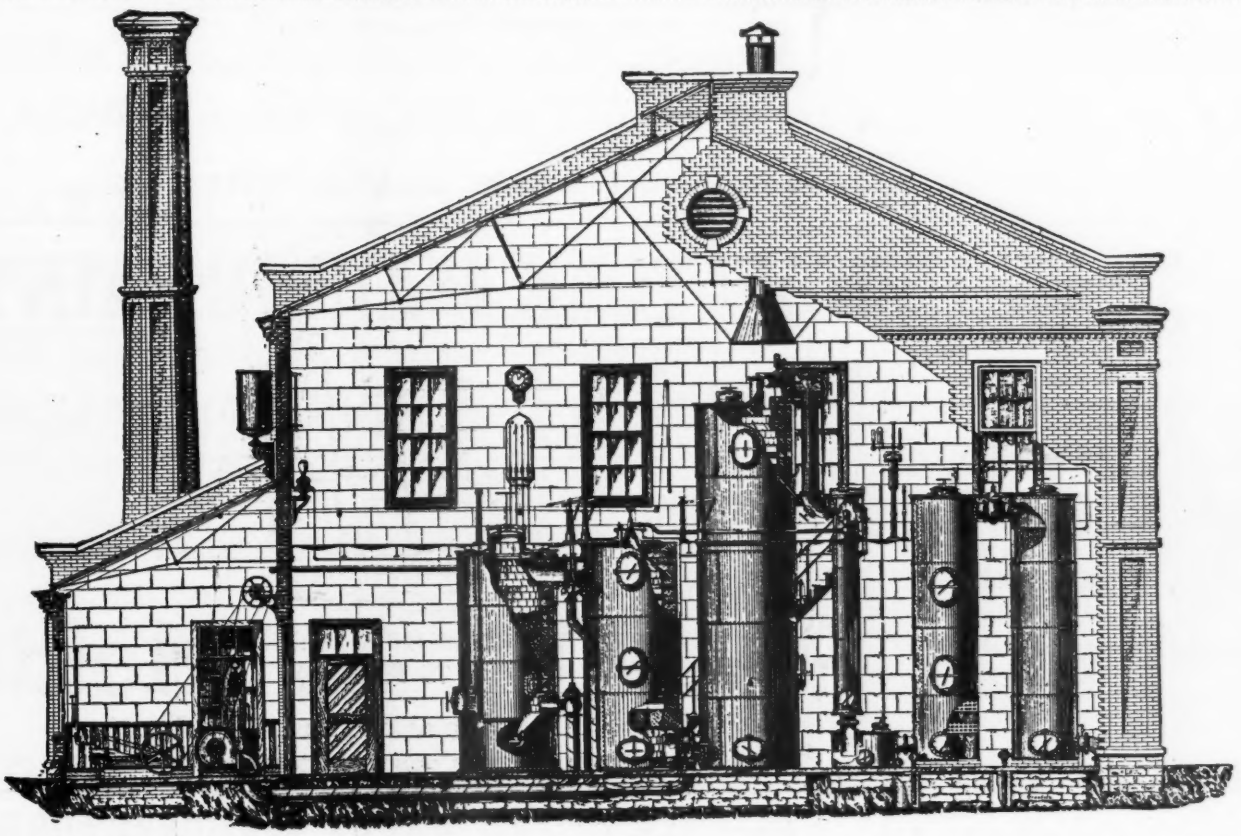

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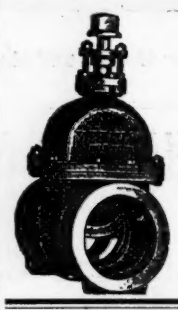

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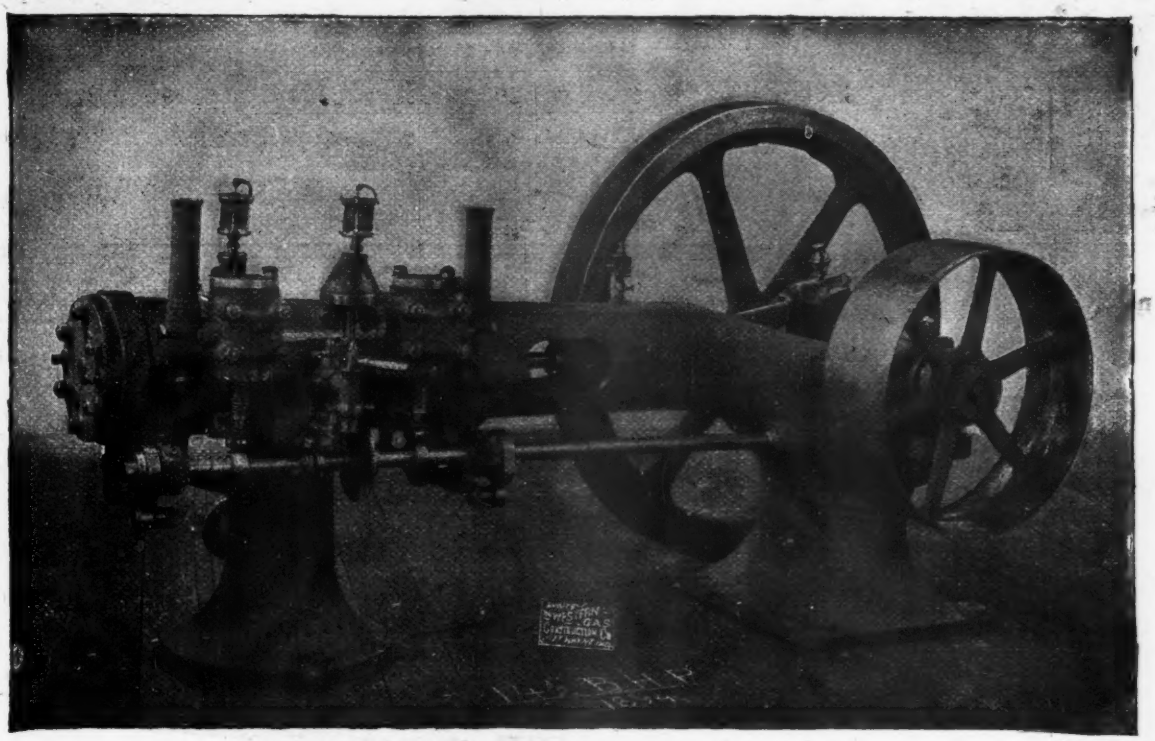

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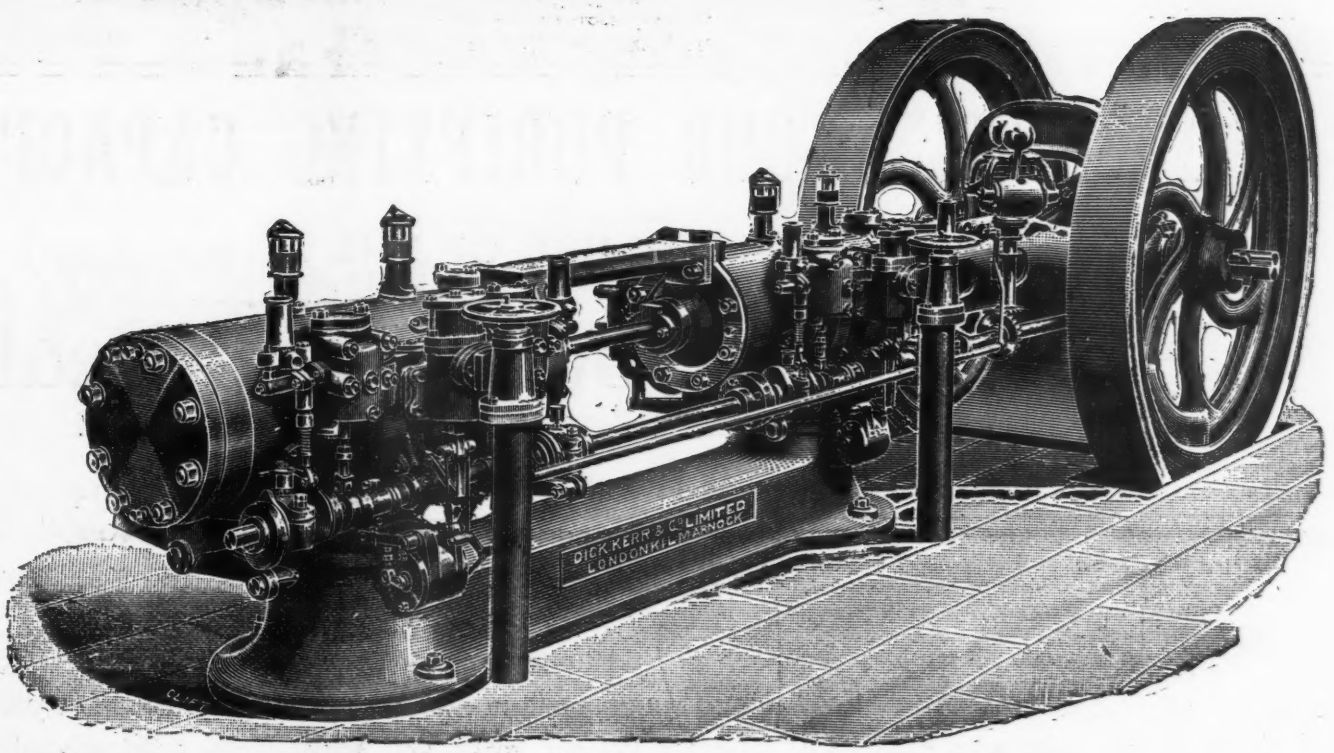

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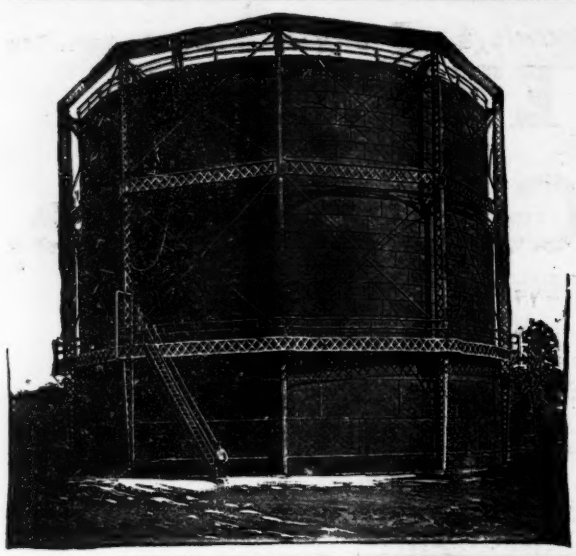

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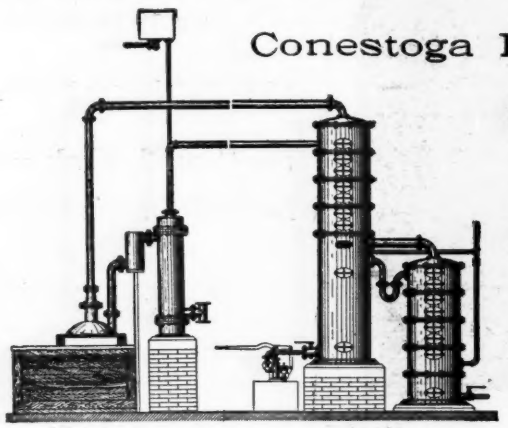

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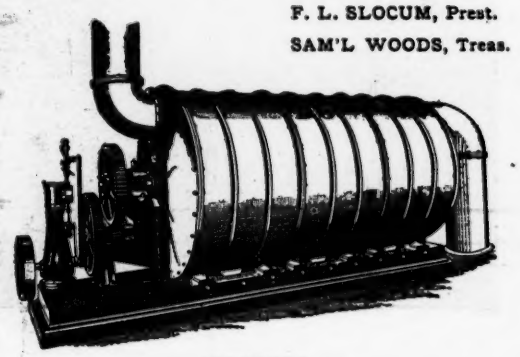

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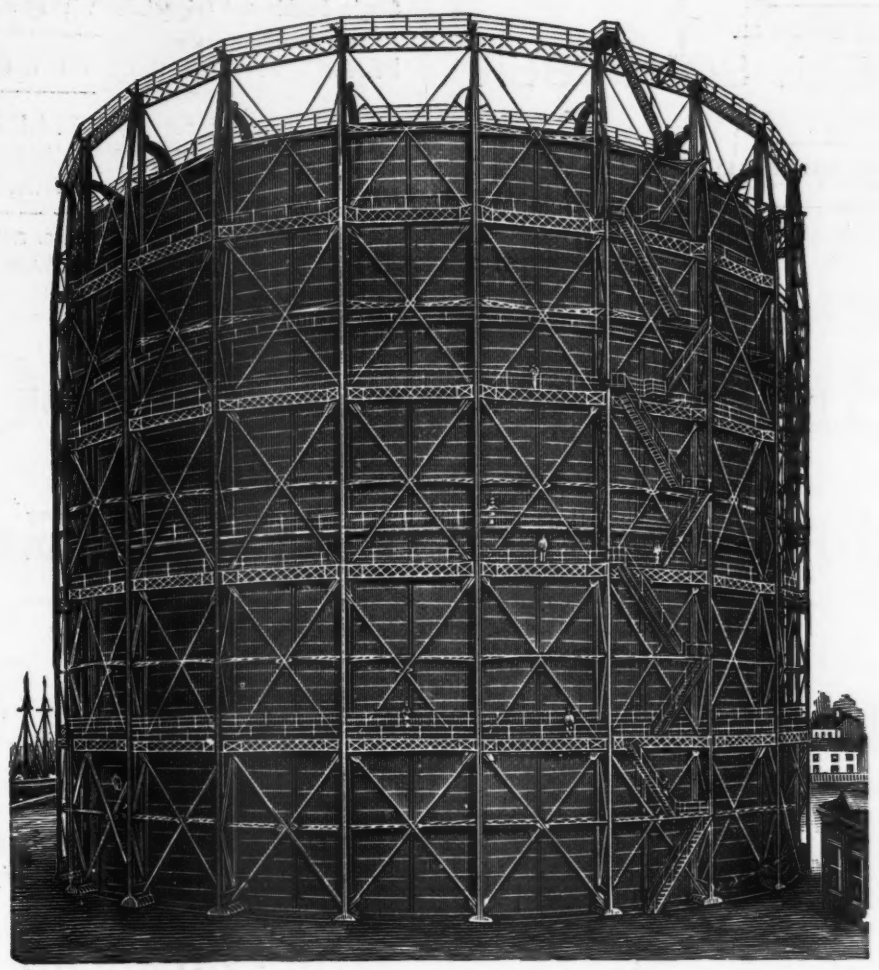

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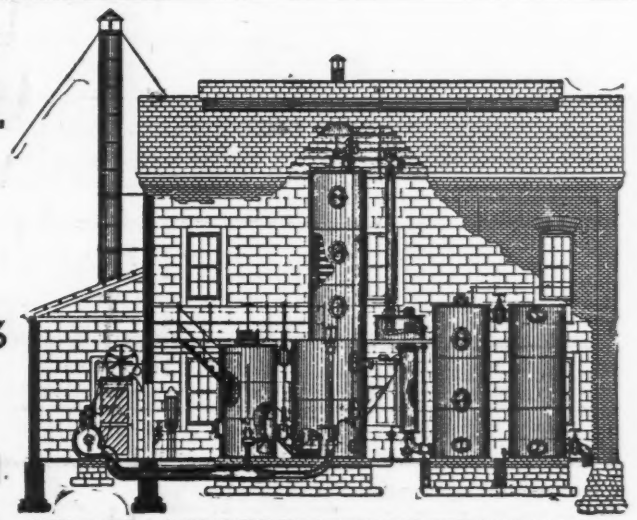

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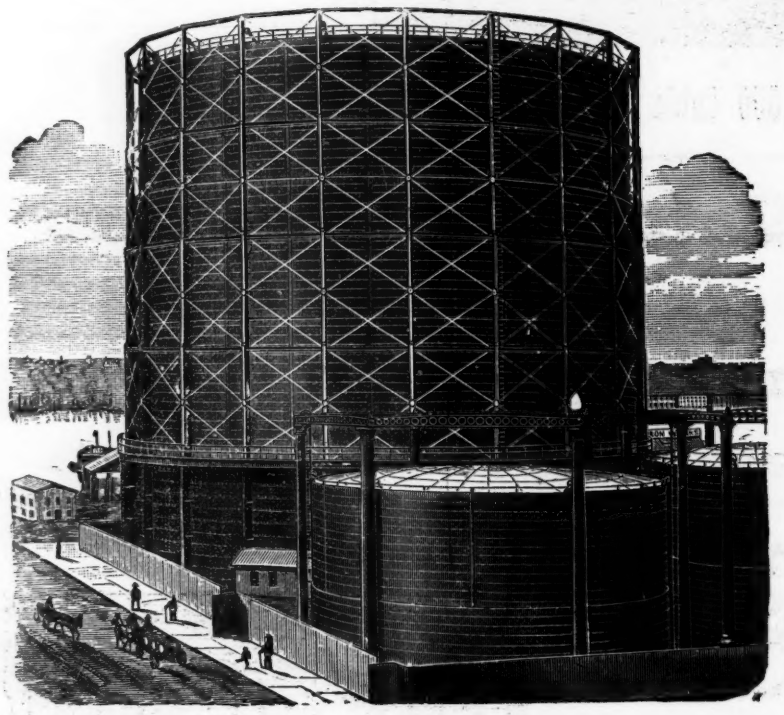

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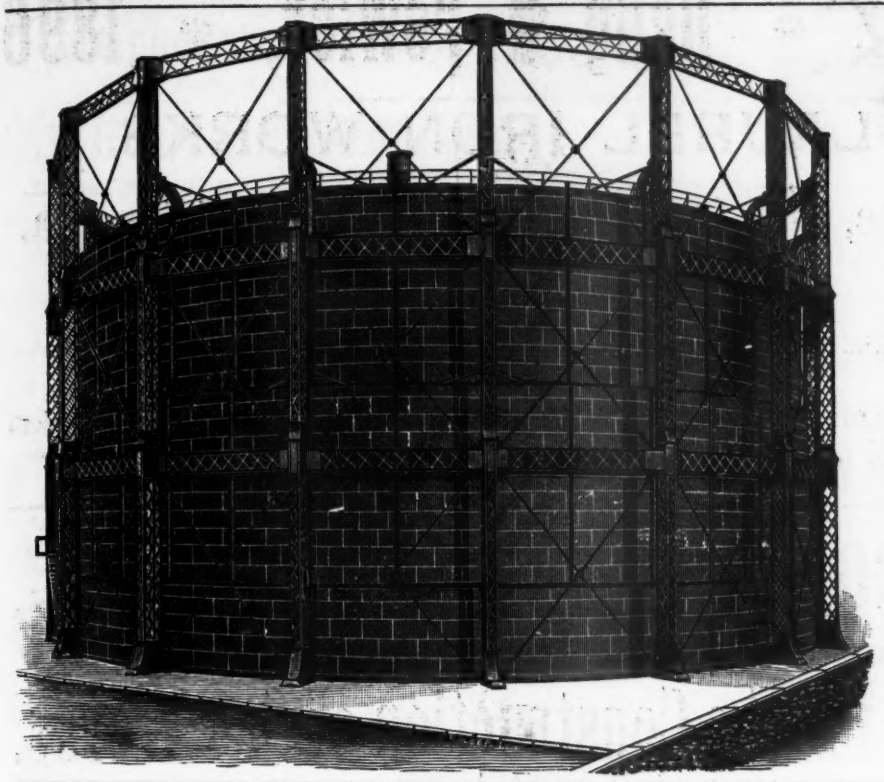

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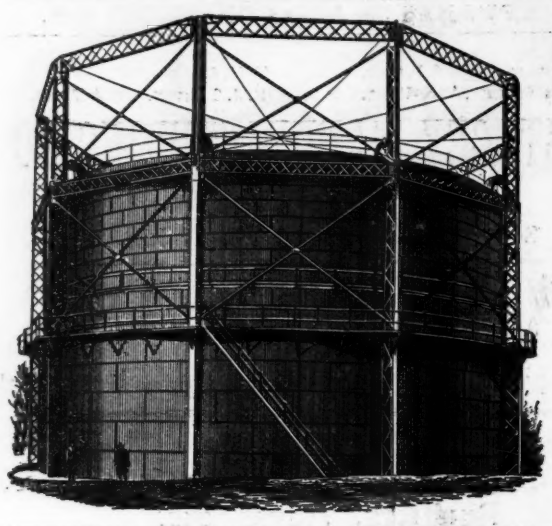

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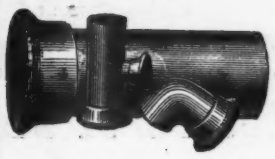

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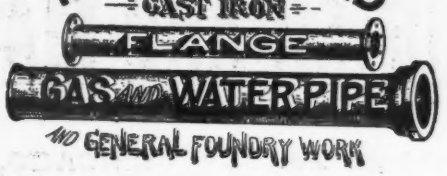

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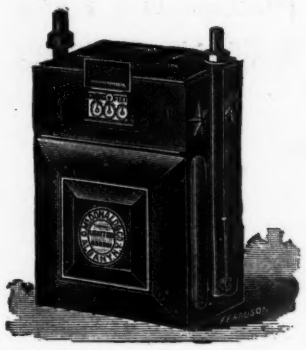

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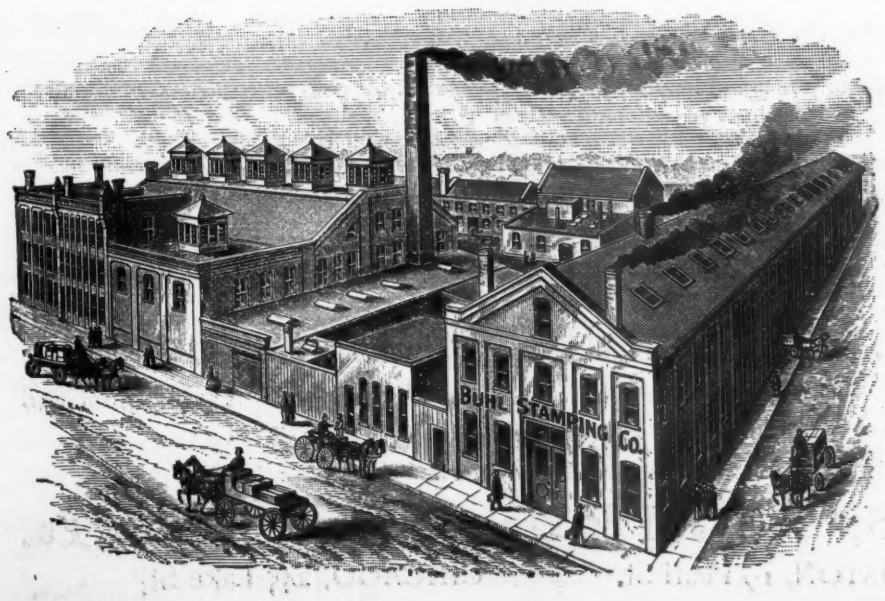

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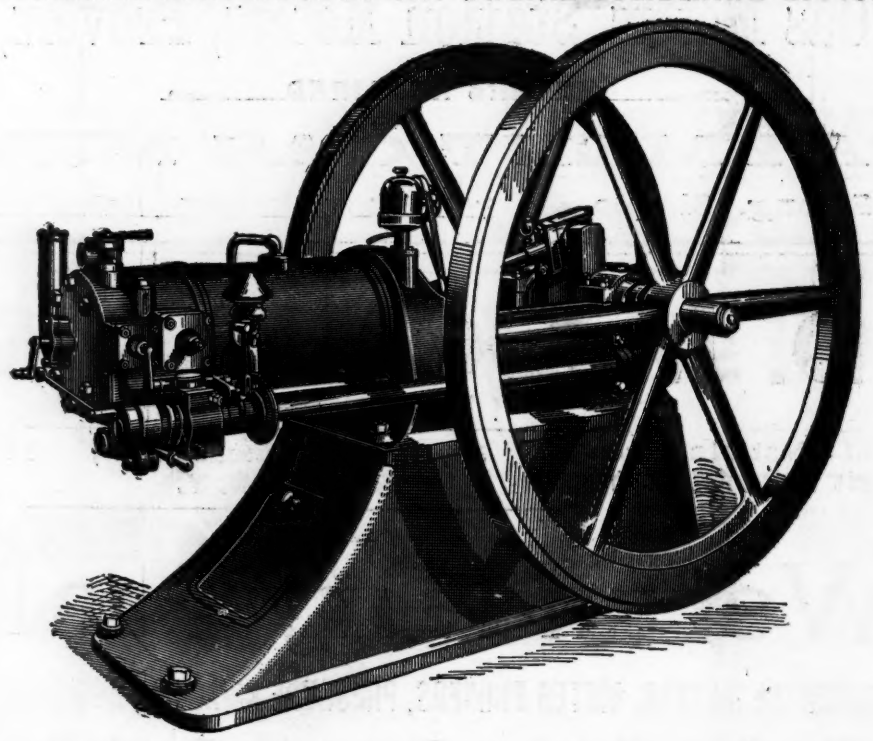

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